THURSDAY, NOVEMBER 27, 1919.

THE ROYAL COMMISSION ON THE UNIVERSITIES OF OXFORD AND CAMBRIDGE.

SEVERAL months ago, Mr. H. A. L. Fisher, President of the Board of Education, made the important announcement that the Government had decided to appoint Commissions to inquire into the position of the Universities of Oxford and Cambridge. At both Universities the existing resources have proved inadequate to meet the increased cost of maintenance of the various departments, and the authorities of each independently applied to the Government for financial aid. It was understood that in due course comprehensive inquiries into the whole resources of the Universities and their colleges, and the use made of them, would be instituted; and preliminary grants of 30,000*l.* to each University were accepted on this condition. With reconstruction in the air and Government inquiries in the fashion, it is not surprising, therefore, that a Royal Commission (under the chairmanship of Mr. Asquith), with separate Committees for Oxford and Cambridge, and a further Committee dealing with estate management, has now been appointed to inquire into the financial resources of the two Universities and of the colleges, into the administration and application of these resources, into the government of the Universities, and into the relation of the colleges to the Universities and to each other.

It is more than forty years since the last Royal Commission on the Universities of Oxford and Cambridge was appointed, and the advisability of a new Commission has frequently been suggested in recent years. The question was debated in the House of Lords in 1907, but it was believed at the time that it would be better for the Universities to institute reforms from within; and at Oxford the Chancellor, Lord Curzon, made an extensive inquiry into the possibility of such reforms, following it up by an open "letter" addressed to the University, containing a number of valuable suggestions. Some of these have since been acted upon, but others, such as the abolition of compulsory Greek in the entrance examination, have temporarily succumbed to the conservatism of certain members of the University, more especially the non-resident members of Convocation. Still other questions, such as that relating to degrees for women, have been postponed owing to the war, but they are likely to come up for consideration in a very short time. Hence there would not have been any very cogent grounds for the immediate appointment of a fresh Commission, had it not been for finance. At Oxford, whilst the income of the University has fallen, its expenses have greatly increased. Science in particular, owing to the increase in the number of its students and to the range of their studies, has been forced to make special demands for further laboratory accommodation and for increased grants for teaching purposes.

Considering the special needs of science, the composition of the Oxford Committee is not altogether satisfactory. Of the nine members of the Committee, only two are men of science, whilst in the Cambridge Committee science has been assigned twice as great a representation. However, there can be no question of the suitability of the scientific representatives themselves. One of them, Sir Henry Miers, when professor of mineralogy at Oxford, was of invaluable assistance, by his moderation and persuasiveness, in bringing the just claims of science before the resident members of the University. Prof. W. H. Bragg will bring to the inquiry the freshness and width of outlook of one who has had experience of research and professorial teaching in two hemispheres. Miss Penrose, the principal of Somerville College, is a worthy exponent of the claims of women, while Labour is presumably represented by Mr. A. Mansbridge.

The Cambridge Committee is one to which, at any rate as individuals, and from the point of view of the University itself, little exception can be taken. It contains one woman (Miss Clough), one representative of Labour (Mr. Arthur Henderson), six (or, including Miss Clough, seven) members of the University, and four distinguished fellows of the Royal Society, namely, Sir W. Morley Fletcher, Sir Horace Darwin, Dr. H. K. Anderson, and Prof. A. Schuster. It is, however, a pity that the younger generation should be so inadequately represented. The Committee has an average age of about sixty years, and although there are many really distinguished members of the University between the ages of twenty-eight and forty-three, and it is these men who will have mainly to bear the brunt of the next twenty years, there is nobody on the Committee to emphasise their point of view. The absence also of an expert in finance, industry, or economics is noteworthy, and—one would imagine—will make the task of the Committee more difficult.

Apart from these objections, however, it is clear that Cambridge has nothing to fear, and may have much to gain, from its Committee's activities. The four scientific members are known as men of sound judgment, wide knowledge, and an enthusi-

asm for scientific progress, while they have been as much concerned with the importance of science to the well-being and prosperity of the community as with its value in education and in the improvement of human knowledge. All of them are men who personally have done valuable original research, and shown the capacity for affairs and the sound judgment necessary in these days of organised scientific work.

The terms of reference of the Commission relate, not only to questions of finance, but also to the government of the Universities and the relations of the colleges to the Universities and to each other; hence the inquiry is likely to be an extensive one. In the course of the inquiries to be made, many anomalies will doubtless be revealed. Our educational structure is curiously unbalanced. It has grown up cathedral-like, and bears witness to the loving, if sometimes misguided, benefactions of many generations. We trust that the Commissioners, while retaining all that is good—and there is much that is worthy of preservation—will ensure a more economical and equitable distribution of the fruits of past benefactions for the encouragement of religion, learning, education, and research.

In particular, we would direct attention to the need for greater facilities for research, not only in pure science, but also in modern philosophy. It is almost incredible that Oxford, the home of classical learning, cannot boast of a single exponent of modern philosophy who might be expected to explore the regions of thought revealed by recent scientific research on space and time. The discontinuities of modern physics should surely not appeal in vain to the heirs of the wisdom of the Greek philosophers.

Further, the hard-worked science tutor should be afforded time and facilities for research. A critical study by the Commissioners of the distribution of tutors in the various subjects and of the relative number of pupils allotted to each tutor would form an instructive lesson on our educational methods. Some relief could be given to science tutors if it were made compulsory for candidates for degrees in science to obtain exemption from preliminary physics and chemistry before admission to the University. This would also relieve the already overburdened laboratories.

Other questions relating to natural science with which the Commission must deal are: (*a*) The urgent need for further buildings and equipment, and for increased staff, if the present rush of students is to be met, and if research is to be maintained; (*b*) the sufficient remuneration of the teaching and research staffs, and the recognition of the fact that the research worker is no less entitled to payment for his labours than the business man, the teacher, or the labourer; (*c*) the better support of natural science by the colleges (in proportion to its importance, natural science is inadequately assisted by many colleges in the matter of scholarships, fellowships, and lectureships); (*d*) the provision of pensions for professors and other officials, and the introduction of a definite age for retirement. This last matter is particularly important in natural science, where the professors have administrative and organising duties, as well as those of lecturing and directing research, and there is no reason why a university should be an exception to the general rule in any large undertaking, national or private, that an executive appointment should be subject to an age limit.

The Committee on Estate Management will have to consider the more efficient administration of college property, and may recommend the adoption universally of the system already agreed to by three important colleges at Cambridge of employing a common estate office connected with the School of Agriculture. The present system of awarding scholarships, the subject of women's degrees, the finances of the women's colleges, and the cost of living of the average undergraduate are among the more controversial matters to be decided. Whatever may be the course of their deliberations, however, it is clear that Cambridge will not be encouraged, as it might have been under another type of Commission, to cease its national function as a home of "religion, learning, and research," and to become a place merely of technical instruction. Whatever faults the Commission may have will lie, not in a lack of sympathy for education and research in the best sense, but in a rather conservative outlook and an inability to understand the urgency of really radical changes, in an insufficient appreciation of the needs and demands of the great labouring classes of the country, and in lack of understanding of the point of view of the younger generation.

PRINCIPLES OF RADIO-COMMUNICATION.

The Principles underlying Radio-communication. Radio Pamphlet No. 40. December 10, 1918. Signal Corps, U.S. Army. Pp. 355. (Washington: Government Printing Office, 1919.) Price 55 cents.

THIS book has been prepared by the Bureau of Standards, Washington, under the direction of the Chief Signal Officer of the Training

Section of the United States Army. It gives an accurate survey of the theory of electromagnetism with special stress on its application to practical radio-communication. Very little mathematical knowledge is assumed on the part of the reader, and the familiar analogies given will be a great help to beginners.

The first and second chapters give a clear *résumé* of elementary electricity and the working of dynamos. In the third chapter radio-circuits are described, stress being laid on coupled circuits, oscillations, damping and effective resistance. The fourth chapter describes electromagnetic waves, and the academic theorist will be surprised at the simplicity and accuracy of the transmission formulæ used in practice. Descriptions of the best types of antennæ and of open and closed coil aerials are also given. In chap. v. the apparatus used in transmission and reception is described, and it is carefully stated which is suitable for damped and which for undamped waves. Chap. vi., the final chapter in the book, will be very helpful to many, as it gives an excellent account of the various types of vacuum tubes now in use. By means of the characteristic curves the working of the three-electrode tube is simply explained. Its use as an amplifier, modulator, and generator of oscillations is fully described. The method of connecting vacuum tubes in cascade is also given.

Many fail to recognise how easy it is to detect radio-waves, and how simple is the necessary apparatus. For damped waves, all that is required is a telephone receiver, a rectifier (crystal "detector," or, better, a vacuum tube), and a tuning coil. It seems to us to be foolish for the Post Office to keep up the comedy of pretending to regulate the use of such sets. Now that the licences to technical colleges have been formally withdrawn it would be politic to issue new ones without any further delay.

The latest developments of radio-communication make the subject of absorbing interest to the engineer and the man of science. For instance, the power involved in the sound-waves generated in ordinary speech is of the order of the hundred-millionth of a watt, and yet in radio-telephony this controls several thousands of watts, the alternating currents being at radio frequency. In the pre-war days the use of crystal rectifiers introduced an element of uncertainty into everyday working. This was overcome by the Fleming valve, which is now replaced by the three-electrode vacuum tube. For measurement purposes the vacuum tube is far superior to the "buzzer" as a source of oscillations. If several tubes are used in the same circuit, and each tube has its own battery, then the amplitude and frequency of the current-waves can be made practically constant.

There are very many interesting and novel facts given which will be of great value to the radio engineer. The book can be heartily recommended to every man of science who wishes to know the latest practical developments. A. R.

ROUND THE WREKIN.

Shropshire: The Geography of the County. By Prof. W. W. Watts. Pp. x+254. (Shrewsbury: Wilding and Son, Ltd., 1919.) Price *2s.* 6*d.* net.

SHROPSHIRE, in its combination of mountain and plain, in the varied flow and scenery of its river, for which the whole county serves as catchment basin, in the extent of its stratified rocks from pre-Cambrian to Lias, in their yield of coal, building-stones, metals, and workable clays, lends itself admirably to treatment by a geographer who is also a geologist, and it is needless to say that Prof. Watts, whose geological studies of the county alone or in conjunction with Prof. Lapworth have been a guide to so many, avails himself thoroughly of the opportunity. The rich and beautiful forests, the meres, and the rocky uplands support a multiform assemblage of birds. The more important among these and other animals are noted, but it might have been mentioned that a complete series of the vertebrate fauna has been collected and placed on exhibition by Mr. H. E. Forrest in the Shrewsbury Museum. The diversified agriculture and the numerous industries down to the making of "churchwardens" are briefly correlated with rocks and soil.

But Prof. Watts recognises that the great interest of Shropshire lies in its human inhabitants and their history. Though Palæolithic man has left no trace in the county, his Neolithic successors are known, not merely from their weapons, stone circles, and barrows, but from their many descendants in the present population. The Brythons, who became the Cymry to themselves, the Welsh to their enemies, are now represented by about one-tenth of the inhabitants. Their coracle is still used by Severn fishermen. It was the struggle between them and the English compound of Angles and Normans that so long made Shrewsbury a city of prime importance. All this eventful history and its relation to the physical features is clearly summarised by Prof. Watts.

The beautiful half-timbered houses of the fifteenth, sixteenth, and seventeenth centuries are famous, but such stone mansions as those of Benthall and Condover, such castles as Stokesay, Ludlow, and Shrewsbury, and the fine ecclesiastical architecture of Buildwas, Wenlock, Ludlow, and Shrewsbury, receive description and illustration so far as space admits. A chapter on the place-names is of peculiar interest, and the sections on communications and the origins of the chief towns are excellent lessons in political geography. Coloured physical and geological maps form the end-papers of the book.

There is an index, but it has not helped a reviewer fresh from his home-county to find the explanation of "Meole," the meaning of the "Weeping Cross," the origin of Bomer and similar "pools," or any reference to the "Burries" or Burgs of Bayston Hill. Farquhar's "Recruiting Sergeant" might be worth a line. A Salopian

also may suggest that the hills once studied by Prof. Watts should be called "the Breidden," not "the Breiddens." But these remarks are not criticisms. The book will prove a charming and trustworthy companion to any observant traveller in the beautiful native county of Charles Darwin.

OUR BOOKSHELF.

Tri-lingual Artillery Dictionary. By E. S. Hodgson. With introduction by Col. J. H. Mansell. In three volumes. Vol. i., *English-French-Italian.* Pp. viii+92. (London: Charles Griffin and Co., Ltd., 1918.) Price 5*s.* net.

WITH the progress of every department of engineering, new technical terms are being continually introduced into the languages of various nations. In the case of artillery, the difficulty of intercommunication which thus arises is considerably increased owing to the conditions under which international relations become necessary in the progress of military operations. Any reader who thinks himself to be a good French or Italian scholar will receive a rude awakening if he opens any page of this book. Even among the most commonplace technical terms he will find the French and Italian equivalents to be quite different from anything that would naturally have been imagined. It is quite evident that much of the work of preparing such a book falls within the definition of original research.

It might be possible for officers of various nations to make each other understand their meaning by pointing to a gun or a model or a drawing, but the use of the telephone renders this method inadequate. By making this dictionary of the size of a quarter-plate photograph, Mr. Hodgson has given officers a book which they can easily carry about and use in communicating with their French and Italian colleagues. The latter ought, of course, to have corresponding books also. It is, moreover, quite certain that a companion volume for German will be urgently needed under any conditions which the future may have in store.

Apropos of dictionaries, the following suggestion is not without a certain significant aspect, namely, that a dictionary is wanted between the language of the Tripos type of mathematical examination paper and the language of the engineering factory. The difference of language certainly does harm. G. H. BRYAN.

The Mycetozoa: A Short History of their Study in Britain; an Account of their Habitats Generally; and a List of Species Recorded from Essex. By Gulielma Lister. (Essex Field Club Special Memoirs, vol. vi.) Pp. 54. (Stratford, Essex: The Essex Field Club; London: Simpkin, Marshall, and Co., Ltd., 1918.) Price 3*s.* net.

THE Essex Field Club has done well to reprint as a whole the subject-matter of Miss Lister's two presidential addresses, and in this way to render them available to a larger public than the readers of the *Essex Naturalist.*

The list of species recorded from Essex is mainly of county interest, but it is the county to which Miss Lister and a number of friends who have been inspired by her work and that of her father have devoted special attention, and therefore serves as an object-lesson to naturalists in other counties. The tabulated lists at the end of the book of the species recorded from similar areas in the Home Counties, the West of England, and the North of Scotland respectively, indicate what may be done by a few enthusiasts in the study of this interesting little group at the base of organised life.

But the greater part of the volume is of wider interest. The first section, on the study of Mycetozoa in Britain, is an historical *résumé* of their study in this country, from the time of John Ray, who refers to one of our commoner species in his "Synopsis of British Plants" in 1696, and of Dillenius, who figures several species in an enlarged edition of the "Synopsis" in 1724, to the classic "Descriptive Catalogue of the Mycetozoa," by Mr. Arthur Lister, in 1894. This monograph, in the preparation of which Miss Lister shared, and the handy little "Guide to the British Species" have done much to extend the study of the group, both in Great Britain and abroad, as is indicated by the rapidly increasing number of species in successive editions of the "Guide," the fourth of which is now being issued by the Trustees of the British Museum.

The second section, on the habitats of the Mycetozoa, will be of great service to workers in indicating where to look for these organisms, and what species are likely to be found in special environments. The habitat varies remarkably, including woodlands, alpine pastures, moorland, rocks, bare earth, sawdust- and straw-heaps, manure, and even bone. A useful list gives a selection of the habitats with the associated species.

Guide to the Study of the Ionic Valve: Showing its Development and Application to Wireless Telegraphy and Telephony. By W. D. Owen. Pp. vii+59. (London: Sir Isaac Pitman and Sons, Ltd., n.d.) Price 2*s.* 6*d.* net.

THIS little book is divided into fifteen chapters, each chapter consisting of three or four paragraphs of large print describing the historical development of the ionic valve, the principles on which it works, and the various types of valve that are now used in wireless telegraphy. The diagrams are clear, of large size, and not overcrowded with details. References are given to the original papers describing the various forms of valves and their developments. The book can be recommended to all who intend to take up the serious study of radio-telegraphy, as it will impress the main facts about the ionic valve on their minds.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

Holland and International Rivers.

IN NATURE of October 16 is published an address on "The International Rivers of Europe," read at the British Association by Prof. L. W. Lyde. A large part of the address is concerned with the proposition that Holland is the only European country which has so far failed to accept the salutary principle that a great navigable river cannot be monopolised by a single political unit against riparians—a proposition which Prof. Lyde tries to prove, amongst other things, by an analysis of the case of the Ghent-Terneuzen Canal.

In order not to occupy too much of your space I shall deal only with that question (although some extraordinary remarks of Prof. Lyde's on the Maas and the Rhine invite comment), and only with the most important aspect of it, which is that of the dimensions of the canal in Dutch territory. Prof. Lyde denies the truth of the Dutch assertion that Belgium has enjoyed freedom of navigation on the ground that the dimensions of the Terneuzen-Ghent Canal are too small in Dutch territory. He then gives an outline of the history of the enlargements, which, if his statement about freedom of navigation means anything, should prove that Holland is responsible for those dimensions. Now not only does Prof. Lyde not prove this, but it is contrary to well-established fact. Holland has never put any difficulties in the way of Belgian desires for the enlargement of a waterway which, as a commercial communication, serves mainly, if not exclusively, the interests of the port of Ghent. Prof. Lyde calls italics to his aid to emphasise that eight years were wasted in the 'seventies before the Convention of 1879 was concluded, which arranged for the first enlargement. Wasted by whom? If one reads up the story in Guillaume, "L'Escaut," vol. ii., p. 439 (the authoritative work on this matter, published in 1902 by the then Belgian Minister at The Hague), one sees that in 1874 already the Dutch and Belgian Governments had reached an understanding, but that the Belgian Parliament, moved by an agitation which had its origin in Antwerp (where Ghent was feared as a possible competitor), threw over the Belgian Government.

The Convention of 1895 was concluded, as Guillaume puts it, "aisément" ("easily")—that is to say, the Dutch acceded at once to the requests put forward by the Belgians. In the same way, when, in 1902, while the enlargement was still being executed, the Belgian experts decided that a further enlargement was desirable, the two Governments agreed almost at once on a new convention in which the dimensions were laid down which the canal has at the present moment. If those dimensions are smaller in Dutch than in Belgian territory, it is because the works of 1895 were in 1902 in a more advanced state in the Dutch than in the Belgian part of the canal, so that in the latter they admitted more easily of readjustment. But the dimensions in the Dutch part are those which the Belgians asked for, and no other, nor have they since then asked for any further enlargement which Holland has refused. On the contrary, if, as a result of the negotiations now proceeding in Paris, new works of enlargement are undertaken, it will be found that the Dutch Government has already acquired ground at Terneuzen in order to facilitate the enlargement of the locks.

Where, in this history, is the justification for complaints about obstacles in the free navigation of Ghent? Prof. Lyde says that under international control improvements would be adopted on their merits—so they have under the existing *régime*; and that under international control the successive enlargements would have been completed much sooner—this is an assertion quite unsupported by any evidence. Prof. Lyde says also that under international control the cost of the enlargements should have been met out of the profits on the traffic. Under the existing *régime* navigation is quite free, and there are no such profits. But I believe that Prof. Lyde advocates the establishing of tolls under an international authority. I doubt whether this extraordinary idea would recommend itself to international commerce or to Ghent!

Far from being unique in denying a neighbour's right of free access to the sea, Holland has in modern times consistently respected it. There has been nothing "stupid" or "selfish" about her attitude. It is perfectly true that she might have acted very selfishly and still remained within the bounds of legality; if that shows that the existing legal *régime* should be amended, it is all the more unfair to blame Holland, who never took advantage of it to harm her neighbour's interests.

P. GEYL.

London, October 25.

I AM obliged for your courtesy in sending me Dr. Geyl's letter. Most of it is concerned with the dimensions of the Terneuzen Canal, which Dr. Geyl calls "the most important aspect of the question." I considered it so unimportant that my only comment on it was: "As the *accidental* difference in dimensions is a real handicap to Belgium, Holland should have been scrupulous to compensate by all possible courtesy and other facilities."

Dr. Geyl goes on to say that my denial that Belgium has had freedom of navigation is based "*on the ground* that the dimensions in Dutch territory are too small"! A glance at the address in your issue of October 16 will prove the inaccuracy of this attempt to divert attention from the actual facts on which I based my assertion that Belgium had not freedom of navigation.

To anyone who would care to know exactly how Holland has acted on these international waterways, I venture to say that Kaeckenbeeck's purely legal "International Rivers" (published by the *Grotius* Society) is more illuminating than Guillaume's account of what is, after all, his own success as Belgian Minister at The Hague.

"Where, in this history," Dr. Geyl asks, "is the justification for complaints about obstacles in the free navigation . . .?" In Dr. Geyl's history, nowhere. Mine was more discursive and gave precise instances, with dates and references, of facilities being denied and delayed by the Dutch; and I notice on p. 319 of the current R.G.S. Journal, in a legal review of Kaeckenbeeck's book, the words: "Germany [on the Rhine] joins hands with the Dutch in setting up restrictive regulations against foreigners." One relatively trivial case illustrates both the denial and the delay. In January, 1906, the Belgian Government formally asked the Dutch Ministry of Finance to forgo customs formalities—with all their delay and inconvenience—on boats moving only and directly between Ghent and Antwerp. The Dutch Ministry replied in January, 1907, and refused.

The profits on the canal trade are so great that Terneuzen has relatively heavier tonnage than any

other Dutch port, even including Rotterdam; and the "extraordinary idea" of putting a toll on boat and cargo for the upkeep and improvement of the waterway is as old as the Roman Empire, and was the actual *régime* on the Rhine in the most prosperous days of its commerce—under the French.

I entirely agree with what Dr. Geyl says about the canal dimensions and their origin, but it does not touch my really serious and deliberate assertion that Belgium has suffered, and is suffering, from gross "international servitude." L. W. LYDE.

University College, London.

The Colours of Racehorses.

IN my "Origin and Influence of the Thoroughbred Horse" (1905, pp. 441 *ff.*) I supported my other arguments to prove that the "blood" horse originated in Libya (North-West Africa), and that his primal colour was bay, by giving in one table the results of my examination of the colours of the winners of the Derby, the Oaks, and the St. Leger, and in another table the colours of the first three horses in each of these races in the three decades from 1870–99. Grey does not appear in them at all, and black only twice, whilst chestnut—which (like brown, black, and grey) I maintain is not an original colour, but due to crossing the bay Libyan horses and the ancient dun horses of the Upper European-Asiatic area—shows a steady decrease.

In view of the discussion aroused by the winning of the Derby by a grey (Tagalie) in 1912, and by a black (Grand Parade) in the present year, it may interest some of your readers if I give my tables brought up to date for the last fifty years:—

TABLE I.—*Winners.*

	b.	b. or br.	br.	ch.	br. or bl.	bl.	gr.
1870–79 ...	15	0	2	12	1	1	0
1880–89 ...	16	0	5	8	0	1	0
1890–99 ...	17	0	7	6	0	0	0
1900–09 ...	15	4	6	5	0	0	0
1910–19 ...	18	0	5	5	0	1	1

TABLE II.—*First Three Horses.*

	b.	b. or br.	br.	ch.	br. or bl.	bl.	gr.
1870–79 ...	36	1	13	34	4	2	0
1880–89 ...	42	1	16	28	0	2	0
1890–99 ...	54	2	17	16	1	0	0
1900–09 ...	47	5	17	19	0	2	0
1910–19 ...	51	2	18	16	0	2	1

It will be seen that in the first three decades chestnut gave way steadily to bay and brown; that in the fourth decade chestnut dropped 1 in the winners, but regained a little in the lower horses (19 against 16); that in the present decade, whilst it retains the same number of winners as in the last, it has lost the slight gain made in the lower horses; and that in the fourth decade bay dropped in the winners from 17 to 15, and in the total from 54 to 47, but the loss in the winners is more apparent than real, since four bay-or-browns were amongst the winners. In the present decade, in spite of the reappearance of black and grey amongst the winners, bay has more winners (18) than ever before, though in the total number of horses it has not quite regained its old position (54).

Thus, in defiance of the sporadic reappearance of black and grey, bay seems steadily bent on superseding all other colours. WILLIAM RIDGEWAY.

Flendyshe, Fen Ditton, Cambridge,
November 4.

Gravitation and Light.

IT may or may not have been noticed that the refractivity $(\mu-1)$ at any point, required to produce the Einstein deflection, is the squared ratio of the velocity of free fall from infinity to the velocity of light. OLIVER LODGE.

Mariemont, Edgbaston, November 24.

Variation of Refractive Indices.

MR. TWYMAN (NATURE, November 20, p. 315) will find in Trans. Chemical Society (1906, vol. lxxxix., p. 417) an account of some observations by Miss Florence Isaac and myself which indicate that the refractive index of a solution of sodium nitrate at the surface of contact with glass is slightly greater than that of the same solution in contact with calcite.

It was our intention to continue and extend these observations, but we have never been able to do so.

HENRY A. MIERS.

The University, Manchester, November 22.

Neon.

IN response to inquiries, may I use your columns to make two announcements in reference to the above?

First, by making use of a new and more powerful method of positive-ray analysis (the description of which is now in the press), I have succeeded in obtaining measurements of mass and other evidence of sufficient accuracy to prove beyond all dispute that atmospheric neon (atomic weight 20·200, O=16) is a mixture of two isotopes of atomic weights 20·00 and 22·00 correct to about 1/10th per cent.

Secondly, permission to publish being now granted, a full account of recent experiments on "Neon Lamps for Stroboscopic Work" will shortly appear in the Proceedings of the Cambridge Philosophical Society.

F. W. ASTON.

Cavendish Laboratory, Cambridge,
November 19.

Bird Migration.

THE captain of the Portuguese steamer *Bolama*, recently touching here on her voyage from Cape Verde Islands to Lisbon, reports that near the Canary Island, Las Palmas, his ship was visited by an immense cloud of swallows settling in thousands upon every part of the vessel and resting until early dawn, when almost every bird departed. Nothing is known as to the direction in which the birds were travelling or why they should be found far away over the open sea in such a southerly latitude. Two swifts are perennially present and nest at Madeira, but the chimney-swallow is only known as a rare straggler; and in the last fifty-five years I have not known of the passing of any migrating flock, though our latitude is five hundred miles north of the locality indicated in the *Bolama* occurrence. So strange an incident might be taken from the pages of Pliny or Ambroise Paré, and cannot fail to interest those of your readers who are working on the subject of migration. MICHAEL C. GRABHAM.

Madeira, October 27.

Luminous Worms.

FROM the communications which reach me I learn that this subject is creating a great deal of interest. At the same time all the information is vague and unsatisfactory, and I am unable to obtain specimens of the creatures themselves. The vagueness of the information is due in great measure to the lack of knowledge which still prevails respecting the Oligo-

chæte fauna of this country. A few local names are in use, such as dew-worm, brandling, lob-worm, and cockspur, but these are as valueless for scientific purposes as cuckoo-flower or bachelor's buttons would be to a botanist.

It will be some time before my volume on British earthworms is published by the Ray Society. In the meantime, will not some publisher undertake to issue a small popular handbook of British worms, with illustrations, at a shilling? We have about fifty earthworms in this country, but only a dozen or so are by any means common, and it would be very easy for our working naturalists to get a grip of the subject, and thereby render immense service to a branch of science which is of the utmost practical value. Though I have written a large number of articles on our Annelids during the past thirty years, there is nothing on the subject which is available in a popular and handy form for would-be students, and in this matter such a handbook is sadly overdue.

May I venture once more to appeal to readers of NATURE for specimens of luminous worms or other creatures, as well as for rare, unusual, or abnormal forms, that would merit attention in my Ray Society monograph? HILDERIC FRIEND.

Cathay, Solihull, November 6.

The Doubly Refracting Structure of Silica Glass.

IN an interesting letter on the above subject in NATURE of October 23 Lord Rayleigh mentions that, when used with accurately crossed Nicols, "a circular disc of optical quality silica showed a spiral structure." Upon reading this letter I was reminded of a very interesting colour effect I saw several years ago in fused quartz which had been acted on by the rays from radium. As is well known, crystalline quartz assumes a uniform yellowish-brown or brownish-red colour when "rayed" by the rays of radio-active substances; the formation of coloured streaks and of patches similar to the markings of marble has also been observed. On the other hand, fused quartz generally assumes a uniform brownish-violet colour when exposed to radium rays.

In his work preparatory to the determination of the atomic weight of radium, Hönigschmid (*Wien. Ber.*, CXX., 1617, 1911) used fused quartz evaporating basins for recrystallising large quantities of radium chloride, and these afterwards showed a remarkable spiral coloration. Radiating from the centre of each basin was a series of spiral-shaped streaks of a dark violet colour, which continued in many cases almost to the top of the basin. Their upper extremity would undoubtedly be limited by the height to which the radium chloride solution had occupied the vessel. The space between the streaks showed little or no coloration. As is usual in such cases, the coloration disappeared on heating the dishes in a Bunsen flame, a brilliant bluish-violet luminescence being produced.

It has generally been assumed that the conditions in the quartz which give rise to these "streaks" are connected with the mode of manufacture of such vessels, and I believe the above colouring effects may be of interest in view of Lord Rayleigh's interesting observation of the "optical heterogeneity" of silica glass. ROBERT W. LAWSON.

The Physics Laboratory,
Sheffield University,
October 31.

The Antiquity of Man.

IN the altogether excellent jubilee number of NATURE (No. 2610, vol. civ.) there is, I notice, a short paper entitled "The Antiquity of Man" contributed by Dr. A. Smith Woodward. We are told in this paper (p. 212) that "as discoveries progress it becomes increasingly clear that true man, of the family Hominidæ, *cannot* [the italics are mine] be earlier than Late Pliocene or the dawn of the Pleistocene." We learn also that "so long ago as 1880" Sir William Boyd Dawkins, "for other reasons," came to the same conclusion.

As your readers are doubtless aware, the question as to when man first appeared upon this planet has always been of what may be termed the "vexed" order, and generally regarded as unsettled.

But though it may be the opinion of Dr. Smith Woodward and of Sir William Boyd Dawkins that "true man" cannot be of a greater antiquity than "Late Pliocene or the dawn of the Pleistocene," it does not necessarily follow that such an opinion is correct. The chief evidence upon which the idea of the great antiquity of the human race is based—evidence not mentioned in Dr. Smith Woodward's article—is that afforded by the various implements of flint and other rocks which have been found embedded in certain Pliocene and Pleistocene strata. These humanly fashioned stones are comparatively numerous, and afford evidence of a more complete type than is provided by the "few fragments of apes and man" which have hitherto been recovered from ancient deposits.

In view also of certain discoveries made in Suffolk since 1909 (described by Sir Ray Lankester and by myself), and the results of the excavations carried out during the last twelve months in the Red Crag at Foxhall, near Ipswich, I would venture to regard it as highly probable that a type of man capable of flaking flints in a clearly dexterous manner was present in that part of the country not later than Middle Pliocene times, and possibly even earlier. Further, these discoveries have demonstrated that, as would be expected, these Mid-Pliocene individuals were preceded by an earlier race or races of people who fashioned their flints in a less skilful manner. But whether these ancient flint-flakers were "true" men or not I am quite unable to say. I should imagine, however, that, judging from the kind of implements found, they had attained to a status far above that of any known ape.

It is clear, then, that Dr. Smith Woodward's views, as expressed in the jubilee number of NATURE, upon the antiquity of man do not coincide with those of many of us who have made a study of early flint implements. Moreover, the fact that such widely divergent views upon this question are possible shows the urgent need for further research, especially as the present palæontological evidence, upon which Dr. Smith Woodward's opinions are founded, is, from its very nature, largely negative in character.

J. REID MOIR.

I THINK our present knowledge of the facts and principles of palæontology justifies the statement I made. I intentionally omitted all reference to chipped flints because I regard them as inconclusive evidence.

A. SMITH WOODWARD.

WESTERN TURKESTAN.

WESTERN TURKESTAN has been, for all practical purposes, a closed land ever since the final subjugation of the Turkomans by Skobeleff in 1880. Political conditions made it difficult for Europeans, and particularly for British, to travel in the province. It was reserved for the

expedition organised in 1905 by an American, Mr. Pumpelly,[1] to make the first scientific exploration of the region between the Pamir and the Caspian. Since then little or no exploration has been carried out.

During 1918 and 1919 opportunities occurred of visiting Turkestan, unhindered by the old restrictions, and much valuable experience was gained by the members of the British forces which at one time and another penetrated the province. A voyage across the Caspian in March, 1919, took me to Turkestan to a point within eighty miles of the Oxus, near Charjui, and the unusual facilities of the journey enabled me to see much that would not have been very accessible under pre-war conditions.

Once the Caspian is crossed and the Caucasus left behind, one is in a region where the subjection of the routine of life to physical limitations is very marked. Krasnovodsk, the port of Western Turkestan, a cluster of drab houses on the foot of arid and treeless hills, lives solely on what the ships and the railways bring to it. The route to inland Turkestan passes south-east from the town, skirting the long arm of Balkhan Bay, and passing between a gap in the hills—a gap which, it is generally agreed by geologists, was more than once in historical times the passage through which the Aral and the Caspian were joined; the northern junction of these waters is believed by Kropotkin and others to have been round the north end of the Ust Urt Plateau into the bay of Mortvy Kulduk.

Once through this gap, the route runs nearly due east, and the plain of Kara Kum opens out to the north with the long *sierra* ridge of Kopet Dagh screening off Persia on the south. From Kizil Arvat to Askhabad, a distance of about 130 miles, the railway and caravan route to the east runs between the desert and the foothills. Numerous prehistoric mounds, mostly of the flat-topped variety, are found along the foothills and bear testimony to the antiquity of the route.

Except for occasional oases, the Kara Kum plain is a vast and continuous desert, almost entirely flat, and with camel-thorn as its only vegetation. But though now it is for the most part desert, the fertility of the oases, round which cotton- and corn-fields are abundant, suggests infinite possibilities, as the desert, at least between Kizil Arvat and New Merv, is of rich clay, and not of sand. Here and there a simple system of converging trenches leading down from the foothills has provided the irrigation the general absence of which is the chief obstacle to agriculture.

Russian rule, prior to the revolution, by encouraging and subsidising the growth on a large scale of cotton and cereals, had largely contributed to transforming the Tekke Turkomans into a sedentary and agricultural race. In place of the temporary camps of forty years ago, one now sees large villages, which comprise groups of two or more *Kibitkas*, enclosed in a mud wall. Sometimes even the *Kibitkas* are replaced by permanent single-storied flat-roofed houses of the Caucasian type—the whole resembling the type of walled farm common in Macedonia. Recent upheavals, however, have revived the nomadic spirit. The Tekke Turkomans, largely at the instigation of the Yomut Turkomans, who are in a less fertile area, have shown signs of a movement *en masse* to less troubled areas in the south.

Askhabad, situated well out on the plain, is in the most fertile region of all Western Turkestan. It serves as the chief internal commercial centre of the province, while Kizil Arvat is rather the clearing-house for exports and imports. Dried fruits, carpets, fish from the Caspian, and furs are always to be found in its large and prosperous market. Afghans from the south, Sarts from Bokhara, Persians from over Kopet Dagh, and even Greeks from Baku and Batum, make up, with the Tekkes and Yomuts, the cosmopolitan crowd typical of a market-place of the Middle East. Whether the produce of the little-known but prosperous seal fisheries of the North Caspian penetrate these regions I was unable to find out, but the museum at Askhabad contains a collection of interesting photographs and implements illustrating this industry.

The main trade connections of New Merv are with the East and South, and carpets and silks form the staple produce of the town. The town itself is on the banks of the Murghab river, which is here no inconsiderable stream, being on an average about 50 ft. in width and well protected with dykes.

Old Merv, the ancient Antiocheia, the mediæval "Queen of the Earth," is situated some twenty miles east of New Merv. It is a sombre and impressive ruin, covering about thirty square miles. The ancient walls of the citadel still stand, hardly damaged by the passage of time, close by the woods and fields of the model estate of the late Tsar at Bairam Ali. The prosperous nature of this estate is proof of what the soil of Turkestan is capable when dealt with scientifically.

Between Old Merv and the Oxus are only rolling sand-dunes, unproductive and desolate. The process of desiccation is still continuing in Western Turkestan, and the geological causes that have affected in so many and various fashions the course of history in these regions are still operative. The Oxus, which originally flowed due north to Aral, later changed its direction, running a south-westerly course into Lake Sarykamish and the Uzboi Channel of the old Aralo-Caspian Sea. Later it reverted to its original northern flow. The Aral has been alternately marsh and sea. The causes of these changes are still the ruling factors in a land where the human element is not active. The province, left to itself, is passing through another cycle in which a shrinkage of water supply is the most marked feature. In 1842 the Abougir Gulf of Lake Aral comprised 3500 square kilometres of water surface; to-day it is practically dry. The province is essentially

[1] See Pumpelly, "Explorations in Turkestan" (Published by the Carnegie Institution of Washington in 1905 and 1908.)

an inland region dependent on adjacent mountains and lakes for its water. Methodical irrigation might yet reclaim much that in the near future will be absorbed into desert. S. CASSON.

THE BRITISH ASSOCIATION AND SCIENTIFIC RESEARCH.

THE valuable work done for science by the research committees of the British Association is well known in the scientific world, but few people outside are familiar with its nature, extent, or influence. It is not commonly understood that all members of such committees render their services without fee of any kind, or even receive travelling expenses to attend meetings; indeed, as a general rule, a member not only gives his time and knowledge freely, but also adds somewhat to his personal expenditure. The association makes grants of a few pounds annually to some of the research committees, but others are without grants; and in many cases the chairmen and secretaries meet the necessary expenses out of their own pockets.

The committees thus represent at its highest and best united work for the promotion of natural knowledge, and their constitution could not well be improved. The subjects and members are put forward by the various sections of the association, and any grants desired have to pass the scrutiny of the Committee of Recommendations, which is made up of representatives of all the sections. The organisation is, in fact, one in which men of science themselves decide upon subjects of research, and allocate the slender funds at their disposal to aid selected inquiries and reports. Obviously, this system is both efficient and economical, and its general adoption would be in the best interests of progressive knowledge.

The amount of money which the association can allocate as grants in aid is, however, only about 1000*l.* per annum, and this has to be shared between thirty or more research committees. As other funds are now available for scientific research, it has been suggested that the association should limit its aid to committees to the payment of secretarial and like expenses, instead of attempting to provide for actual investigations by the small grants it is able to afford.

The work of the research committees has, however, been of such high value throughout the existence of the association that no one would wish to make any change which would diminish its importance; and there is not the slightest doubt that whatever funds the association has available for research will be usefully applied. The present position is clearly stated in the subjoined communication from Prof. John Perry, treasurer of the association, being mainly remarks made by him before an evening discourse on September 11 at the recent Bournemouth meeting of the association. No general appeal is made for funds, but it is to be hoped that wealthy benefactors will follow the example of Sir James Caird and others interested in the promotion of scientific knowledge, for no more effective machinery for attaining this end could be devised than that provided by the British Association committees.

"You are aware that, after paying printing and office expenses, the funds of the British Association are devoted to scientific research. For more than eighty years we have spent more than 1000*l.* a year on research, long before ordinary people had heard of research.

"Every year we form many research committees; each of them is formed of the foremost men of science of Great Britain, who receive none of the money themselves, and their accounts for mere out-of-pocket expenses are carefully audited. These researches in the past have created some entirely new sciences, have led directly and indirectly to the creation of many new industries, and they have largely produced the world's present natural knowledge. And now to my point. Yesterday a very prominent member of the association asked me about our finances. I had to admit that even before the war we were meeting with difficulties due to the increased cost of printing and other things, that since the war we have been behindhand to the extent of more than 1000*l.* every year, and that we have never yet asked for the help of moneyed men. The only gift we have ever received from a moneyed man was a voluntary gift from Sir James Caird, who handed me 11,000*l.* at the Dundee meeting. My questioner said we ought to ask for help, and that he was willing to start a fund with a sum of 1000*l.* At this moment he does not wish to have his name mentioned.

"I need not dwell on the importance of our research work, as I feel sure that every person here who has himself done original work shares my opinion that when we limit our expenditure on research, and especially on pure scientific research, we shall begin to be a bankrupt association—bankrupt, that is, morally from the point of view of science, if not actually in the financial sense.

"The moneyed men of Great Britain are most willing to help any good object when they get proof that it really is a good object. We cannot complain of want of their help, for they did not know the facts. At the same time, the treasurer of an association with such a record as ours does not feel happy at the prospect of begging for help."

In the two days of the meeting following that on which I made this statement, the fund was raised to a total of 1475*l.* I intend to publish in due course a list of names of donors and donations.

To illustrate by many instances (as I might) our claims as to the importance of our researches would unduly prolong this letter, and any selection of a few examples would be unrepresentative. I will cite a single illustration:—The National Physical Laboratory, the scene of researches of which the importance to the nation during the war and earlier cannot be overestimated, had its origin (if its antecedents be traced backward) in the Kew Observatory, which was maintained by the British Association from 1842 to 1872, in which period the association spent some 12,000*l.* on its upkeep.

DR. JOHN AITKEN, F.R.S.

DR. JOHN AITKEN, widely known for his unique researches in meteorology, died at Ardenlea, Falkirk, on Friday, November 14, at the ripe age of eighty years. Although he served his apprenticeship as a marine engineer, Dr. Aitken's intellectual interests drew him into the fields of

physical research, for which he received a stimulus as a student under Sir William Thomson (Lord Kelvin) in Glasgow University. He lived a retired life in Falkirk in a house which was largely fitted up as a laboratory, whence he would emerge from time to time to communicate some novel experiment or observation to the Royal Society of Edinburgh. Dr. Aitken frequently visited the Continent, partly for his health's sake, and never failed to utilise his opportunities in studying at first hand the varied meteorological conditions of our globe. He published scientific papers in the *Philosophical Magazine* and through the publications of the Royal Societies of London and Edinburgh, but it was mainly through the latter society that his important investigations were laid before the scientific world.

In his classical memoir on dust, fog, and clouds (1880) Dr. Aitken broke entirely new ground, and by his later paper on dew (1885) he consolidated his reputation as a natural philosopher of the first rank. Those who were privileged to see his demonstrations before the Royal Society of Edinburgh in 1880 can never forget the effective simplicity of his apparatus and the clearness of the argument by which he established the great truth that invisible dust particles are the nuclei on which water vapour condenses to form mist, fog, and cloud in all their infinite variety. By successive slight exhaustions of saturated air in a glass receiver, and by infiltration through cotton-wool of ordinary air from the outside, he gradually cleared it of dust particles; and when this purification had been effected, expansion with cooling of the enclosed air was, in general, unaccompanied by the formation of cloudy condensation. He noted, however, in these early experiments, that after the air had been thus purified of dust particles, a more rapid and somewhat greater expansion was sometimes accompanied by cloudy condensation. The explanation of this was afterwards given by Mr. C. T. R. Wilson, who showed that in dustless saturated air suddenly expanded electric ions acted as nuclei on which drops of water were deposited. This ionic condensation requires a distinctly greater diminution of pressure than is needed to effect the cloudy condensation in ordinary unfiltered air, and in his last paper on the subject of cloudy condensation (Proceedings R.S.E., 1917) Dr. Aitken gave many experimental illustrations of his belief that under ordinary atmospheric conditions the nuclei on which fog, mists, and clouds form are fundamentally the dust particles, although the effect may be occasionally intensified by the presence of ions.

Dr. Aitken followed up his main investigations in many ingenious ways, inventing, for example, an instrument for counting the number of particles in a given specimen of air, and applying it to the study of the conditions under which the number of dust particles varied according to locality, wind, barometric pressure, or time of day. In all these discussions he displayed unusual powers of accurate observation, great skill in devising crucial experiments, and singular gifts in interpreting natural phenomena. His researches led him into questions of colour in cloud, sky, and sea, and into the dynamical laws of cyclones and anti-cyclones. In this last branch of meteorology he found himself at variance with other leading meteorologists. Dr. Aitken was elected a fellow of the Royal Society of Edinburgh in 1875, and of the Royal Society of London in 1889. By the former he was awarded the Keith medal and prize (1886), and the Gunning jubilee prize (1895), and by the latter a Royal medal in 1917. In 1899 he received the degree of Doctor of Laws from Glasgow University. He was a lovable personality and of great modesty of disposition. Much though his many friends desired it, he would never allow himself to be nominated for high office in the Royal Society of Edinburgh. This, he maintained, was not his *forte*. He was a humble student of natural phenomena, and his one desire was to elucidate the workings of Nature in her everyday moods. C. G. K.

NOTES.

THE Electricity (Supply) Bill, which passed the report stage in the House of Commons on Tuesday, is a laudable attempt by the Government at constructive economy. In almost every business, combination and standardisation lead to great economies, and this applies in a very special manner to the supply of electricity. An attempt was made on Monday to prove that the Bill in its present form was a breach of the agreement made in the Act of 1888 whereby a term of forty-two years was granted to the companies to carry on their supply without Government interference. This is perhaps technically right, but the companies have no real grievance. The Bill leaves their distributing business undisturbed, and guarantees to supply them with electricity as cheaply as they could generate it for themselves. Lord Moulton and others have laid great stress on the economy, from the point of view of the conservation of coal, of using gas for heating instead of electricity. Many electrical engineers will agree with this view. But although electrical supply companies will provide energy for heating —generally at prohibitive rates—when they are specially asked, they regard the heating load as of minor importance. Electrical heating forms only one of the manifold uses of electricity. Every engineer knows that cheap power is essential to many of our most important industries. Our supremacy as a commercial nation depends on a plentiful supply being available. A cheap and abundant supply would soon effect an industrial revolution, and be a special boon to the manual workers. Another objection that has been urged against the Bill is the danger of strikes. If a national system of supply were adopted, and if the electric workers went on strike, the work of the nation could be held up at any moment and the nation forced to grant the demands of the workers, however unreasonable they were. The experience gained by the workers, however, during the recent railway strike ought to discourage similar action against the community in the future.

UNDER a Bill introduced by the Government last week, power is given to the Board of Trade to safeguard "key" industries in this country by prohibiting the importation of certain articles. Of chief scientific interest among these are analytical reagents, photo-

graphic and various other "fine" chemicals, optical glass, laboratory porcelain, scientific and optical instruments, synthetic drugs and perfumes, coal-tar dyes, and dyestuff intermediate products. The method of prohibition is by means of an Order of the Board, but such Orders are to be subject to the approval of a Trade Regulation Committee, consisting of four political heads of Departments, three permanent officials, and ten Members of Parliament. Licences for the importation of any of the prohibited articles may be granted, either generally or in respect of specific quantities or shipments. The proposals appear to be carefully and fairly devised to meet what is admittedly a difficult situation. They have been referred to as measures injurious to scientific teaching and research, but if the industries producing the articles in question are not to be strangled out of existence in this country they must for a time be protected against "dumping"; while the power to allow importation when this appears necessary should act as a check upon excessive prices and prevent scarcity of particular products. The measure in question is eminently one in which very much will depend upon judicious administration.

AMONGST the younger generation of naturalists in this country there would seem to be a great dearth of men well qualified by training and experience to study entomology, not merely as a pastime or for the pleasure and delight they may find in it, but as one of those sciences of life which are of the greatest present value to the State and to humanity at large, and full of potentialities for the future. There was a time when, to one seeking a profession or other means of livelihood, the prospect presented by entomology looked very black indeed, but, according to a letter from Sir Alfred Keogh which appeared in the *Times* of November 20, a number of reasonably well-paid posts are now open to trained young entomologists. The difficulty in finding men properly qualified to fill them need not be a cause of surprise when it is considered that until recently there was scarcely a professional post of the kind in this country outside the British Museum, and that the few in the museum were by no means well-paid. They appear to be no better paid now. Another correspondent, whose letter signed "F.R.S." was published by our contemporary on Saturday last, points out that the pay of an assistant in the museum begins at little more than one-third of the pay of a lieutenant in the R.A.M.C., and never, while he remains an assistant, does it reach a higher level than the pay at which that lieutenant begins. He might have added that an assistant in the Natural History Museum very rarely has a chance to get beyond that stage, since the higher appointments are so extremely few in both number and proportion compared with those in other branches of the Civil Service. There is one only in entomology, which is the second largest department, and the other departments in the same branch of the British Museum are scarcely better off in that respect. It is astonishing that, at a time when the value of science is becoming daily more and more appreciated even by the general public, this state of affairs should continue to exist in one of our leading scientific institutions.

AT the invitation of Lord Glenconner, a very distinguished company assembled at his house in Queen Anne's Gate on Monday last to hear an exposition of the subject of relativity by Sir Oliver Lodge. To give a non-mathematical explanation of the principle and show how it leads to the prediction of changes in the perihelion of Mercury's orbit, which are unexplained by Newtonian theory, the deflection of a ray of light from a star passing near the sun, and the displacement of lines of solar and stellar spectra towards the red, was obviously impossible, and Sir Oliver did not attempt it. He limited himself to a statement of the close agreement between the predicted and measured deflections of star places derived from the photographs of the total solar eclipse of May 29 last, and to an explanation of the effect on dynamical principles. If gravitation is assumed to affect the refractive index of the æther, so that at every point $\mu - 1 = v^2/c^2$, where μ is the refractivity, v the velocity of free fall from infinity, and c the velocity of light, this condition would give the Einstein deflection. Gravitation cannot increase the velocity of light, but Sir Oliver thought that there might be a kind of gyrostatic effect upon a beam coming from infinity the result of which would be a deflection such as has been observed. He preferred to endeavour to explain the observations on dynamical principles before bringing in a new theory. Prof. Schuster, however, at the close of the address, urged that the best way to deal with a theory was to accept it as a working hypothesis and put all its consequences to the test. The announcement of the eclipse results has brought the relativity principle into prominence in the general Press, and many people have consequently become interested in it. For several years scarcely a volume of NATURE has been without contributions on the principle, and we would direct particular attention to two articles in our columns of June 11 and 18, 1914, by Mr. E. Cunningham, a Royal Institution discourse by Prof. A. S. Eddington in the issues of March 7 and 14, 1918, and one by Sir Oliver Lodge in those of September 4 and 25 last.

As was to be expected, the results of the Eclipse Expedition confirming Einstein's theory of gravitation have called forth discussion, support, and opposition from those who find their own particular point of view, physical or metaphysical, in agreement with or in opposition to Einstein's. On the physical side further contributions to the question of the displacements predicted in the solar spectrum are eagerly looked for, and we are glad to note that Sir Joseph Larmor had something of value to communicate to the Royal Society on this point last week. On the metaphysical side the columns of the *Times* have been opened to Mr. Frederic Harrison, reminding us of the views of Comte on the relativity of space and his opposition to the conception of an æther filling all space. At the same time Mr. Thomas Case stoutly defends the view that Newton's definitions and comments on absolute space and time are sound philosophy and firm foundations of his fame; while Prof. Wildon Carr points out that all the modern relativist arguments can be found in Descartes' "Principles." At a meeting of the Cambridge Philosophical Society on November 24 Prof. Eddington gave an exposition of Einstein's theory to a crowded and eager audience of students. In the discussion following, Prof. Hobson remarked that the abstractness of a theory of the physical universe is in no sense an objection to its validity, any theory or hypothesis being in its essence an abstract scheme built up by the mind to fit those phenomena which have been examined up to date.

THE chairman of council of the Royal Society of Arts, Sir Henry Trueman Wood, in an interesting and thoughtful address at the annual meeting on November 19, reviewed the progress which has been made in the development of our natural resources and in the application of science to industry since the foundation of the society more than a hundred and sixty years ago. He pointed to one outstanding fact, that "all our progress was accomplished by individual action, not by State organisation or control."

Latterly, of course, owing to the increase of scientific knowledge, there had been considerable modification of procedure, the introduction of new methods, and the rise of new industries. Now, partly as a result of witnessing the advantages of organisation and of State aid in relation to German industries, there is an increasing demand in this country for similar organisation and help. The State in its attitude towards invention has been, until quite recent times, merely obstructive to progress. Now there seems some risk of running to the opposite extreme. However, as remarked by Sir Henry, it appears to be "the nature of man to swing from one extreme to another like a pendulum," and we have "to remember that if the pendulum swings to and fro, making no advance, still, all the same, the clock goes steadily on." He directed attention to the work of the Department of Scientific and Industrial Research (already described in NATURE), and spoke hopefully of the work carried out under its auspices by the industrial research associations which have been established in connection with various trades. One of the most important, which seems at last to be about to start effective operations, is the Association for Cotton Research, the headquarters of which will be in Manchester.

THE council of the Royal Meteorological Society has awarded the Symons memorial gold medal for 1920 to Prof. H. H. Hildebrandsson for distinguished work in connection with meteorological science.

SIR HENRY A. MIERS, Vice-Chancellor of the Victoria University of Manchester, has been elected president of the Manchester Literary and Philosophical Society.

DR. J. E. STEAD has been nominated by the council of the Iron and Steel Institute as president for next year in succession to Mr. Eugene Schneider. The date of the annual meeting of the institute has been fixed for Thursday and Friday, May 6 and 7, 1920.

PROF. J. C. MCLENNAN, professor of physics and director of the physical laboratory in the University of Toronto, has since 1917 been lent to the Admiralty by the University, and since January last has been acting as Scientific Adviser to the Board of Admiralty. It is now announced that the Lords Commissioners of the Admiralty have received with much regret Prof. McLennan's resignation of this post.

SIR NATHANIEL DUNLOP, whose death in his ninetieth year is recorded in the *Engineer* for November 21, entered early the service of the Allan Line Co., and rose to be deputy chairman. He was also chairman of the Clyde Trust from 1905 to 1907, and received his knighthood shortly after the opening of the Rothesay Dock. Amongst his other activities he was the first chairman of the British Corporation for the Registry of Shipping, and was its honorary president until the last. He served on a number of Royal Commissions appointed to inquire into shipping questions, and was frequently a witness before other Commissions.

CAPT. P. R. LOWE has recently been appointed by the Principal Trustees of the British Museum to be assistant in charge of the bird-room at the Natural History Museum in succession to Mr. W. R. Ogilvie-Grant. Capt. Lowe has for many years devoted himself to ornithological research at the Natural History Museum, the Royal College of Surgeons, and Cambridge University, and has made extensive collections of, and observations on, birds in Madeira, the Canaries, the Azores, the Cape de Verde Islands, the West Indies, Mexico, Florida, the Mediterranean islands and coasts, South Africa, and the British Islands. He has published numerous papers on ornithology, and is the author of "Our Common Sea-Birds," "A Naturalist on Desert Islands," and of the forthcoming works "In the Track of Columbus" and "The Waders." During the war Capt. Lowe served in the R.A.M.C., and was for two and a half years in command of Princess Christian's hospital train.

WITH the object of promoting the technical and practical development of commercial aeronautics, an Institute of Aeronautical Engineers has been founded. It will be developed largely in the interests of aeroplane mechanics and pilots. Like certain existing institutes of a similar character in other branches of engineering and in chemistry, admission to the various grades of membership is to be by examination, in which piloting experience will be a qualification as well as laboratory work and knowledge of mechanical science. The work of the institute is to commence with next year, when an opening address will be delivered by Prof. Bryan, the president-elect for 1920. The secretary is Capt. Douglas Shaw, and the offices are at 32 Charing Cross, Whitehall, London.

ACCORDING to a Bulletin issued by the National Research Council of the United States, and reproduced in *Science* for October 24, the Council has decided, with the co-operation of the American Physical and Chemical Societies, to compile and issue an American Compendium of Physical and Chemical Constants. It is to be both critical and up-to-date, and to this end the universities and research laboratories of America are to be asked to supply the constants at present known. The business and industrial concerns are then to be asked what other constants are required in their work, and the joint committee charged with the issue of the Compendium will see that they are determined and included in the work. The cost is estimated at 20,000*l.*, and this will, it is expected, be obtained from private sources. We need not emphasise here the great value such a Compendium would have for scientific and industrial research in this country. Tables of constants from which untrustworthy values were excluded have been much needed in the past half-dozen years.

THE Secretary of State for the Colonies has, with the approval of the Cabinet, appointed a Committee to prepare a complete scheme of Imperial wireless communications in the light of modern wireless science and Imperial needs. The Committee will (1) consider what high-power wireless stations it is desirable on commercial or strategic grounds that the Empire should ultimately possess; (2) prepare estimates of the capital and annual costs of each station—the life of the plant and buildings, as taken for the calculation of depreciation, to include an adequate allowance for obsolescence; (3) examine the probable amount of traffic and revenue which may be expected from each station; and (4) place the stations recommended in their order of urgency. The Committee is composed as follows:—The Right Hon. Sir Henry Norman, Bart. (chairman), Mr. F. J. Brown, Rear-Admiral F. L. Field, Sir John Snell, Prof. J. E. Petavel, Dr. W. H. Eccles, Mr. J. Swinburne, and Mr. L. B. Turner. The secretary is Brig.-Gen. S. H. Wilson, and the assistant secretary Lt.-Col. C. G. Crawley. All communications in connection with the Committee should be addressed to the Secretary, 2 Whitehall Gardens, S.W.1.

THE work of the National Union of Scientific Workers is described in the first annual report of the

executive for the year ending September 30, 1919. The union consists at present of 603 members distributed among a large number of local branches, and shows evidence of great activity in various directions. Among the more interesting are those concerned with the steps taken whereby the union may be registered as a trade union and secure representation on the Whitley councils set up by the Government for its own employees. The status and payment of a living economic wage to research workers have been the subject of consideration, and the union may in this direction prove a much-needed corrective to the growing exploitation of junior workers and their diminishing power to protect themselves. As a healthy revolt against a situation that has become intolerable, and in which the official spokesmen of science have taken only desultory interest, the formation and work of this union are among the most characteristic signs of the times, and its further career will be watched with keen interest. Experience from the early history of other trade and professional unions shows that it is the first step that counts, and the report seems to indicate that the initial difficulties are in course of being surmounted.

In a recent Smithsonian publication (Smithsonian Miscellaneous Collections, vol. lxix., No. 11) Dr. Aleš Hrdlička, curator of physical anthropology in the U.S. National Museum, Washington, sums up the results of a study of historical and anthropological data relating to the population of Russia. From the point of view of an anthropologist Dr. Hrdlička concludes that, although the "Russian giant may have his Delilahs internally as well as externally," nothing can prevent the population of Russia from coming by its potential powers. He bases his forecast on the fact that there are more than 100,000,000 Russian Slavs, and that every year their birth-rate adds 1,700,000 to their total numbers. "Such a rate of increase of this strong and able portion of the white stock means a biological momentum which in the end must prevail over all opposition." Dr. Hrdlička also notes the fact that there is neither anthropological nor linguistic reasons for the separation of the Ukrainians from the other Slavs of Russia. This is only another example of the fact that claims for national recognition need have no basis in racial differentiation.

A correspondent of the *Morning Post* (November 12–13) describes the results of a series of excavations in Mesopotamia conducted by officers of the British Museum. At the beginning of the war the work was in charge of Capt. Campbell Thompson, and it was intended that on his departure on leave he should be replaced by Prof. King, but on the lamented death of that scholar the veteran explorer, Mr. H. R. Hall, took his place. The result is that thirty-two huge cases of antiquities have safely reached England, and throw new and welcome light on Sumerian culture. The most remarkable discoveries were made at Tell Obeid, close to the Biblical Ur of the Chaldees, and include a basalt statue of a king or viceroy who lived five hundred years before Gudea, about 3000 B.C., and a wonderful copper plaque representing a lion-headed eagle, the symbol of the city of Lachish. At Maqayya or Ur a royal palace built about 2400 B.C. has been excavated, and Capt. Campbell Thompson has unearthed a remarkable series of bricks and other artefacts at Abu Shahrein, the city of the Sumerian deity En-ki, god of earth and water. With this material available English archæologists have no longer to depend on the discoveries made by American and French explorers. It may be hoped that strong pressure will be put on the Office of Works to vacate the museum galleries and permit a public exhibition of these valuable antiquities.

In the *Kew Bulletin* (No. 8, 1919) M. N. Owen gives an account of one of the minor diseases of potato-tubers, which has never been thoroughly investigated. It is known as skin-spot, the tubers becoming dotted with small dark spots during storage. It is found to be due to a minute species of mould-fungus hitherto undescribed (*Oospora pustulans*). The author describes in detail the structure and development of the fungus as determined from artificial cultures. The disease is confined to the surface layers of the tubers, and, besides disfigurement, may cause serious injury by weakening or destruction of the eyes.

Of economic importance is a report on the paper-making qualities of Hawaian bagasse, or sugar-cane refuse, by A. D. Little (Report of the American Station of the Hawaian Sugar Planters' Association, Bulletin No. 40). The author discusses various previous attempts to use the waste fibre of the cane as paper-making material, the technique involved, and the commercial aspect of the question. As a result of the investigation it is his opinion that, technically, there are no difficulties which could not fairly easily be overcome, and from an economic point of view the use of bagasse might present under normal conditions an attractive commercial venture.

The unfailing energy of Prof. Pearson's department at University College, London, has now resulted in the production of a series of tracts published by the Cambridge University Press. The objects of this new series are not only to publish new tables (as well as to republish old and inaccessible tables), but also in due course to issue works on interpolation, mechanical quadratures, calculating machines, and other matters of importance to the practical computer. The first of the series is before us, and is entitled "Tables of the Digamma and Trigamma Functions," by Eleanor Pairman. The work contains tables of the logarithmic derivate of the Gaussian Π-function and of its derivate, in addition to some useful miscellaneous information concerning these two functions. The functions are tabulated to eight places of decimals at intervals of 0·02 from 0 to 16, with tables of second differences. There seems no doubt that this series will be of extreme value to computers, and we must feel deep gratitude to Prof. Pearson for using the resources at his disposal in producing it. Finally, it should be said that the appearance of the first of the series is up to the standard which we have grown accustomed to expect from the Cambridge University Press.

In making sulphuric acid by the "contact" process, sulphur dioxide is converted into the trioxide by catalytic oxidation and the product absorbed in water to form the acid. A short account of the very effective "Grillo" plant, erected for the purpose in this country by the Ministry of Munitions, is given by Mr. Raymond Curtis in the Journal of the Society of Chemical Industry for October 15. The catalyst employed is platinum, deposited on granules of calcined magnesium sulphate in the proportion of 0·3 per cent. The purified gases from the sulphur burners, heated to about 350° C., are passed through two converters in parallel, each containing 10,000 lb. of the platinised mass distributed on four trays. For absorbing the trioxide produced, towers packed with quartz are used, and practically perfect absorption can be obtained. The purification of the gases, which is important in preventing deterioration of the catalyst,

is effected by passing the cooled vapours through coke columns and sulphuric acid drying-towers; arsenic is thus eliminated, and less than 0·02 per cent. of other impurity (water and inert dust) retained. Details of efficiency and production costs are given.

ALTHOUGH salvarsan (dihydroxydiaminoarsenobenzene dihydrochloride) has proved to be an effective remedy for syphilis, its use in medicine is open to the objection that its administration involves the use of a somewhat elaborate technique. Various attempts have been made to overcome this difficulty, the most successful of which is probably the substitution of the sodium *N*-methylenesulphinate (neo-salvarsan) for the parent compound. Medical opinion on the whole is, however, in favour of the view that salvarsan is more powerful and more certain in its action than neo-salvarsan, though the latter is not without its advocates. In continuation of work begun in 1907 by Prof. F. L. Pyman and his collaborators, Messrs. Baxter and Fargher, of the Wellcome Chemical Research Laboratories, described at the last meeting of the Chemical Society a number of arsenic compounds prepared in the hope that they would be suitable for direct intravenous injection in simple aqueous solution. These compounds are arsenobenzenes of a new type obtained by the reduction of benzodiazolearsinic acids, which in turn are produced by the action of acetic or formic acid on diaminophenylarsinic acid and its homologues. The new arsenobenzenes form dihydrochlorides which are soluble in water, but, though they exhibit a reduced acidity as compared with salvarsan, they still prove to be too acid for direct intravenous injection. These experiments are, however, of considerable interest, forming as they do the nucleus of further work on the replacement of amino-groups by heterocyclic nuclei in arsenobenzenes.

ONE of the latest of the many developments of the Mallet type of locomotive on American railways is a simple or non-compound engine for goods and banking service, built at the works of the Pennsylvania Railroad. From an article in the *Engineer* for November 7 we extract some particulars of this locomotive, which weighs 287 tons, or just above 400 tons with the tender. There are four cylinders, 30·5 in. by 32 in.; the driving-wheels are 62 in. in diameter; the boiler-pressure is 205 lb. per sq. in.; and with a maximum cut-off of 50 per cent. the maximum tractive effort is about 135,000 lb. The size of the boiler is notable; its overall length is 54 ft., including a 14·5-ft. fire-box, 11·5-ft. combustion chamber, 20-ft. barrel, and 8-ft. smoke-box. The barrel diameter is from 8·25 ft. to 9 ft. Expansion movements in the great length of the firebox and combustion chamber are provided for by a folded connection plate forming a **U**-shaped pocket. A mechanical stoker is used, and the fire-box has a shaking grate operated by power. The grate area is 112 sq. ft., the heating surface 6656 sq. ft., and the area of the superheater surface 3136 sq. ft. The short cut-off employed in the Mallet engine as a substitute for compounding has been criticised by writers, who consider that the system does not possess the advantages which it may realise when applied to the usual type of simple locomotive.

Messrs. Blackie and Son, Ltd., announce "Triumphs of Invention," C. Hall. *The Cambridge University Press* will shortly publish "The Foundations of Music," Dr. H. J. Watt. *Messrs. Hodder and Stoughton* are to publish "Aerial Transport," H. Thomas, and "Applied Aeronautics," G. P. Thomson. *Messrs. Longmans and Co.* announce a new edition of Prof. W. Watson's "A Text-book of Physics," revised by H. Moss. *Sir Isaac Pitman and Sons, Ltd.*, have nearly ready "Electric Lighting in the Home," L. Gaster and J. S. Dow, and "Compressed-Air Power," A. W. and Z. W. Daw. *The University of London Press, Ltd.*, promise "Africa and Europe" (being Book iii. of the New Regional Geographies Series). It will include the British Isles and the new boundaries resulting from the Peace Treaty. The section relating to the British Isles will also be issued separately.

IN the official announcement of the reorganisation of the Board of Agriculture and Fisheries which was published in last week's NATURE, it should have been stated that Sir A. Griffith-Boscawen has been appointed deputy chairman, and Sir A. Daniel Hall vice-chairman, of the President's Administrative Council.

OUR ASTRONOMICAL COLUMN.

THE LEONID METEORIC SHOWER.—Observations at the middle of the present month proved that a few of the meteors were visible, and that the display was prolonged beyond its usual duration. On the night of November 15, in 2¾ hours, Mr. C. P. Adamson, watching from Wimborne, Dorset, recorded eleven Leonids radiating from 151°+22°. On November 19 he saw five Leonids near their radiant at 149°+23°. The latter result corroborates an observation in 1876 November 19–22 at Bristol by Mr. Denning, who saw five Leonids from 149°+22°. These figures would appear to prove that there is no decided motion of the radiant similar to that affecting the centre of the great Perseid stream. A brilliant meteor was seen by Mr. Adamson on November 19 last at 11h. 5m. It gave a series of flashes near the termination of its course, which was from 120°+21° to 140°+16°, traversed in two seconds.

TWO STARS WITH LARGE PARALLAXES.—Prof. F. Schlesinger gives particulars in *Astr. Journ.* (No. 758) of two stars within 14′ of each other that both have large parallaxes and proper motions, and yet are apparently quite independent of each other. The brighter star is B.D.+4·123°, which was found thirty years ago to have an annual P.M. of 1·4″. The following determinations of parallax have been made:—

Name	Parallax	Prob. error
	″	″
Schlesinger	0·15	0·008
Chase	0·16	0·048
Flint	0·18	0·040

The other star is of the twelfth magnitude, and was independently found by van Maanen and Wolf to have an annual P.M. of 3·0″. Its place for 1900 is R.A. oh. 43m. 53s., N. decl. 4° 54·4′.

The following determinations of parallax have been made:—

Name	Parallax	Prob. error
	″	″
Schlesinger	0·27	0·012
van Maanen ...	0·244	0·008

There would seem to be a fair presumption that the faint star is considerably nearer than the bright one, and hence that their close juxtaposition in the sky is accidental.

The second star is one of the twenty stars nearest to the solar system, and is evidently (like the Barnard and Innes stars) in the extreme dwarf stage. It would be of interest to determine its visual magnitude, which is likely to be brighter than the photographic one.

APHELIA OF PLANETS AND COMETS.—Mr. C. D. Perrine examines the grouping of these aphelia in Proc. Nat. Acad. Sci., U.S.A., September, 1919. The grouping of aphelia of the minor planets about a strongly marked maximum in longitude 195° has been pointed out before. It is shown that the aphelia of the forty-five short-period comets are grouped in the same manner. It is further remarked as a coincidence (it can scarcely be more) that the aphelia of the eight major planets are all situated in the same half of the ecliptic, their centre of mean position being in the longitude of the apex of solar motion. The aphelia of the long-period comets appear to be grouped about two maxima, the most strongly marked being near longitude 90°, the other near longitude 270°. Mr. Perrine notes that these are respectively the longitudes of the antapex and apex, and deduces a theory that the comets are captured from interstellar space. The obvious difficulty presents itself that the great majority of such objects would enter the sun's domain with independent velocities of the order of several miles per second, and their orbits would, in consequence, be strongly hyperbolic. Mr. Perrine escapes from this difficulty by suggesting that practically all these hyperbolic comets would pass too far from the sun for us to see them; we should only see those the independent velocity of which was practically zero. These last would, however, be only a very small fraction (perhaps one in ten thousand) of the comets entering the sun's domain, so the number of these would have to be immensely large to supply the number of parabolic comets that we see. The latter number is two or three a year, so the former number would need to be reckoned by millions every century.

THE BRITISH SCIENCE EXHIBITION, GLASGOW.

AN exhibition on similar lines to those of the British Science Guild's Exhibition of last summer is now being held by the Corporation of Glasgow, with the assistance of a scientific advisory committee. The Kelvin Hall, in which the exhibition is held, was erected for the purpose of holding a series of industrial exhibitions, and the Corporation has a special department for their organisation. The exhibits are housed in a single building and on one level, so that there is ample space for their display, and power is available for setting machinery in motion and allowing demonstrations of high-temperature operations. The exhibits are, therefore, seen under very favourable conditions, and the response to the invitation to exhibit has been very gratifying. Owing to an unfortunate combination of circumstances, several firms which were represented in London have been unable to appear, and the absence of some of the leading instrument firms is noticeable; but many of the London exhibits reappear, in some cases in an enlarged form, whilst there have been many additions, especially in regard to engineering and shipbuilding.

A very large area is covered, and an inspection of the exhibition convinces a visitor that the objects shown were well worth bringing together. The enormous progress made during the war and since the armistice in the manufacture of products for which we were entirely dependent on importation is evident, as is the ingenuity displayed in the design of new instruments and machines, both for warlike and for peaceful use. The relaxation of restrictions in regard to secrecy has made it possible to show many improvements which had been kept secret for military reasons, so that there is a most interesting series of instruments illustrating recent developments in wireless telegraphy and telephony, and a very extensive display of modern improvements in aircraft, as shown by the work of firms in the Clyde area.

Steam turbines and oil engines are well represented, as well as such interesting inventions in marine engineering as variable-speed gearing and hydraulic transmitters. Many systems of high-temperature welding, especially with the electric arc, are shown in operation, and examples of varied uses of this process are shown, including the junction of the vertical framing and the roof principals in a steel-frame building. The coal industry is represented by a full-sized model of a coal seam with electric coal-cutters at work, and there are also exhibits illustrating the utilisation of the iron ores and oil-fuel supplies of this country.

The chemical exhibits are, in the main, the same as those which were shown in London, whilst the metallurgical industries naturally receive special attention. The Health Department of the city shows a large and instructive collection of preparations illustrating the relation between micro-organisms and disease, as well as diagrams relating to the smoke nuisance. Several Government Departments and universities are represented by stands, at some of which demonstrations are carried on. A kinematograph hall is used for showing films of scientific interest in connection with engineering, shipbuilding, and metallurgy, as well as with bacteriology. The educational value of the exhibition is very great, and a most remarkable picture is presented of the capacity of British manufacturers to accomplish good work when advantage of scientific guidance is taken.

The opening ceremony was performed on Monday, November 17, by Sir Charles Parsons, the Lord Provost of Glasgow presiding, and testimony was then given as to the importance of science to industrial progress. The exhibition has the advantage of following closely on a most successful housing exhibition, also held by the Corporation, and visited by enormous numbers of people, so that there is every reason to expect results which will be beneficial to science and to industry alike by bringing the two into closer contact, and in educating the public as to the necessity for a close co-operation between them. The exhibition remains open until December 6.

A NEW ASTRONOMICAL MODEL.

THE illustrious scholar Gerbert (A.D. 940–1003), afterwards Pope under the name of Sylvester II., was apparently the first of the schoolmen who illustrated his theoretical lessons on astronomy by the use of globes, which he constructed with his own hands. About the year A.D. 1700 George Graham invented a machine to show the movements of the earth and planets about the sun, a copy of which was made for Charles Boyle, the Earl of Orrery. Hence the name of an apparatus very useful for illustrating lessons in astronomy, although Sir John Herschel did call orreries "very childish toys." But surely the difficulty in teaching astronomy is to make the young pupil think in three dimensions. What are we going to do when the relativists would have us imagine phenomena in four dimensions?

Some forty years ago the prospectuses of schools generally advertised among the subjects taught "the use of the globes and deportment." Presumably the orderly arrangement of the solar system was to be reflected in the conduct of the pupils. The "use of the globes" seems to have disappeared from the apparatus of pedagogy, although the teaching of geography and the elementary notions of astronomy are very much facilitated by their employment. But

astronomy as a class subject of general education has unfortunately suffered a lamentable eclipse. Globes have been ousted by calorimeters. Hence the ignorance of even otherwise cultured people of the very elements of the science. Lately there have been welcome signs of a recognition of its educational value, both in the elementary and in the secondary schools. In the Middle Ages astronomy was one of the seven subjects in the curriculum of a liberal education. Those who were privileged to listen to the charming discourse of Prof. Nunn to the Association of Mathematical Masters last January were able to understand how much can be done with cardboard, cylinders, cubes, and other simple appliances to illustrate the chief motions of the heavenly bodies, the observations being made and recorded by the pupils themselves.

Very heartily then do we welcome, for both its scientific and its educational capabilities, the excellent model lately constructed by Dr. William Wilson, and exhibited to the Royal and Royal Astronomical Societies, the British Association, and most of the leading educational and astronomical societies. Everyone who has seen the model has given it unstinted praise. The mechanism is very good. Gearing is done away with, its place being ingeniously supplied by cords and pulleys, with tension regulators and adjustable driving-wheels. There is nothing much to get out of order in the machine. If it does, it can easily be repaired.

But the great value of the model is in the orderly sequence of the astronomical phenomena which can be illustrated by its aid. The pupil is made to advance gradually from the simple to the more complex movements of sun, earth, and moon, illustrating such topics as the year, month, seasons, phases of the moon, motions of the earth, and eclipses, until finally he reaches such phenomena as the retrograde motion of the moon's nodes, the forward motion of the line of apsides of the moon's orbit, and the nature, number, and character of the eclipses possible in any year. It would be a mistake to set up the whole model at once. The curiosity of the pupil should be aroused and his interest sustained by adding the parts gradually and in due order, beginning with the simpler parts, and then advancing to the more complex movements.

Dr. Wilson is to be heartily congratulated on having produced such a valuable, workable astronomical model. So many science masters—excellent omen!—have desired to acquire it that he has felt justified in putting it upon the market and getting it made in quantities. The price is 22*l.* net, carriage paid to any part of the United Kingdom. All communications regarding the model should be addressed to Dr. Wilson himself at 43 Fellows Road, London. N.W.3.

A. L. CORTIE.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

GLASGOW.—At a graduation ceremony held on November 18, honorary degrees were conferred on the American Ambassador, Lord Weir, Sir Joseph Maclay, the Duchess of Atholl, Dame Helen Gwynne-Vaughan, and others, in recognition of war service.

LEEDS.—The following honorary degrees have been conferred:—*D.Sc.*: Admiral Sir Henry Jackson, First Sea Lord, 1915–16; Surg.-Gen. Sir Alfred Keogh; Sir Almroth Wright; Prof. W. H. Bragg; and Mr. J. G. Baker.

LONDON.—The Senate has appointed Sir Cooper Perry to the post of principal officer, which has been in abeyance since Sir Henry Miers's resignation in the summer of 1915. Sir Cooper Perry has represented the faculty of medicine on the Senate from 1900 to 1905, and again from 1915 to the present time, and has been Vice-Chancellor of the University since June, 1917. He will take up his new duties on February 1 next.

The Senate has adopted a resolution expressing appreciation of the generosity of the Worshipful Company of Goldsmiths in presenting to the London Hospital Medical College 15,000*l.* National War Bonds for the endowment of a University chair of bacteriology bearing the name of the company and tenable at that college. The thanks of the Senate have also been accorded to Lord Cowdray for a donation of 10,000*l.* towards the fund for the reconstruction and re-equipment of the engineering buildings at University College, and for a promise of an additional donation of the same amount to be given when the total sum collected in response to the appeal for this purpose reaches 70,000*l.*

A bequest of approximately 3000*l.* is made in the will of the late Mr. T. S. Hughes for the encouragement by scholarships or otherwise of original medical research at the University.

In recognition of the munificent gift of 34,500*l.* by Sir Ralph Forster, Bart., to the fund for the chemistry building and equipment at University College, it has been resolved that the organic department of the chemical laboratories should be known by his name.

The degree of D.Sc. (Economics) has been conferred upon Mr. R. C. Rawlley, an internal student, of the London School of Economics, for a thesis entitled "Economics of the Silk Industry."

The Graham Legacy Committee has, under the regulations for the administration of the Charles Graham Medical Research Fund, made the first award of the gold medal to Dr. Charles Bolton in recognition of the original work in experimental pathology which he has conducted in the medical school of University College Hospital.

OXFORD.—The twenty-first Boyle lecture was delivered by Prof. A. Keith on November 19. Taking for his subject "Race and Nationality from an Anthropological Point of View," the lecturer pointed out that racial problems properly so called came into view only at the beginning of the nineteenth century. The prehistoric record might be divided into a long period of natural subsistence, marked by little change of condition, and a shorter period of conquest of Nature, which was rapid and fateful. The outfit for the first period, both bodily and mental, being in some respects unsuitable for the second, the racial problem resolved itself in effect into a conflict between inherited instinct and present conditions. Illustrations of both racial and national feeling consequent on the contact of different peoples were given from the negroes of North America, the French-Canadians in their relation to the surrounding white population, the Europeans and Maoris in New Zealand. The mingling of blood in South America appeared to have been socially less successful than the maintenance of racial frontiers in the north. Racial feeling, concluded the lecturer, is implanted by Nature for her own purposes of evolution.

DR. J. PROUDMAN has been appointed professor of applied mathematics in the University of Liverpool.

THE Toronto correspondent of the *Times* announced on November 24 that the buildings of the Laval University at Montreal have been destroyed by fire, and the damage is estimated at 400,000*l.* The chief damage was done in the medical department of the University.

SEVERAL representatives of British universities are now in Belgium as guests of the Belgian Government, in order to examine, among other matters, an arrangement for the exchange of teachers and students between British and Belgian universities.

THE under-mentioned staff appointments have been made at the Bradford Technical College:—*Head of Department of Chemistry:* Prof. R. B. Abell. *Lecturer in Chemistry:* Mr. H. P. Starck. *Head of Department of Biology:* Mr. A. Malins Smith. *Head of Department of Dyeing:* Dr. L. L. Lloyd.

ON November 22 President Poincaré inaugurated the French University of Strasbourg. Every endeavour is to be made to attract to the University English and Scottish students who before the war found their way to Bonn, Heidelberg, and Göttingen. The Paris correspondent of the *Times* says that the Germans have left behind them credits amounting to nearly 30,000,000 francs (1,200,000*l.*), which are available for the improvement of the scientific equipment of the University.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 13.—Sir J. J. Thomson, president, in the chair.—Lt.-Col. R. **McCarrison**: The genesis of œdema in beri-beri. Conclusions previously reached by physiological methods of adrenalin estimation are confirmed by chemical methods. Deficiency of certain accessory food factors gives rise to a greatly increased production of adrenalin. Whatever the function of adrenal medulla may be, excessive production of adrenalin, under conditions of "vitaminic" deficiency, is concerned with causation of œdema.—W. **Robinson**: The microscopical features of mechanical strains in timber and the bearing of these on the structure of the cell-wall in plants. The gross and microscopic characteristics of failure in compression are described for spruce, ash, and pitch pine. It is shown that failure is initiated by the development of microscopic planes of slipping in the cell-walls of the wood. The appearance of the slip planes in the cell-walls is accompanied by profound changes in the behaviour of the latter towards many stains and reagents. These changes are discussed in relation to their possible bearing on the process of lignification of cell-walls. In addition to compression, the failures in longitudinal tension and longitudinal shearing are described.—W. B. **Bottomley**: The effect of nitrogen-fixing organisms and nucleic acid derivatives on plant-growth. The products of the nitrogen-fixing organism, *Azotobacter chroococcum*, are shown to have a marked effect in increasing the rate of growth of plants of *Lemna minor* in water culture; and the derivatives of nucleic acid, which the author has found can be extracted from raw peat, are also able to act as accessory food substances. The addition of these two separate materials to the culture solution increased the number of plants from 1817 in mineral solutions only to 96,921 and 80,179 respectively in the liquids containing these substances. Not only was the rate of multiplication increased by these organic materials, but the plants supplied with them also maintained their normal size and health. The nitrogen-fixing organism, *Bacillus radicicola*, is found to have a similar effect to that of *Azotobacter chroococcum*. A similar series of experiments was carried out with the ash of the crude nucleic acid derivatives and of the Azotobacter growth, and neither of these materials had the slightest effect on the rate of multiplication or the health of the Lemna plants. It is therefore the *organic* material which is so essential for the complete metabolism of these plants, and they cannot maintain their normal growth and vigour for any length of time without the presence of small quantities of organic substances.—Agnes **Arber**: The vegetative morphology of Pistia and the Lemnaceæ. Anatomical examination of the "limb" of the leaf of *Pistia stratiotes*, L., the river lettuce, shows that, in addition to normally orientated vascular bundles, there is a series of inverted bundles towards the upper surface. This fact is regarded as indicating that the leaf is of the nature of a petiolar phyllode. This interpretation is extended to the distal part of the frond of the Lemnaceæ (duckweeds).—W. J. **Young**, A. **Breinl**, J. J. **Harris**, and W. A. **Osborne**: Effects of exercise and humid heat upon the pulse rate, blood pressure, body temperature, and blood concentration. The results point to the fact that both exercise and humid heat play a part in producing a rise in blood pressure, pulse rate, and rectal temperature. The degree of rise, however, is controlled by atmospheric conditions, which influence the rate of cooling of the body.

Zoological Society, November 4.—Dr. A. Smith Woodward, vice-president, in the chair.—F. Martin **Duncan**: Photographs showing the actinic quality of the light from a living Pyrophorus beetle. In describing the method employed to obtain the records, the author stated that photospectroscopically the greatest intensity of light action appeared to be in the yellow-green region.—E. **Heron-Allen**: Skiagraphs of the foraminiferan genus Verneuilina from examples grown in a hypertonic tank.—Miss Joan B. **Proctor**: The variation in the number of dorsal scale-rows in our British snakes.—Dr. G. A. **Boulenger**: Some new fishes from near the west coast of Lake Tanganyika.—Dr. G. **Marshall**: The species of the Balaninus occurring in Borneo (Coleoptera, Curculionidæ).—The Hon. P. **Methuen**: Description of a new snake from the Transvaal, together with a new diagnosis and key of the genus Xenocalamus, and of some Batrachia from Madagascar.—Prof. J. P. **Hill**: The placentation of Tarsius.—R. I. **Pocock**: The external characters of Tarsius.

Geological Society, November 5.—Mr. G. W. Lamplugh, president, in the chair.—H. H. **Thomas**: Some features in the topography and geological history of Palestine. A perfectly new method of illustrating and investigating some branches of physical geology is afforded by aeroplane photography. It seems, first, to illustrate in a very striking and convincing form many geological phenomena, such as the structure of a volcano or the land-forms resulting from erosion, and may be of value in the teaching of the science. In the second place it may, in certain circumstances, become a valuable means of research, especially in connection with river development or denudation in a region which is somewhat inaccessible, or where the surface of the ground is very complicated and the main features are obscured by a mass of less important detail. The lecture dealt principally with the illustration of the physical features of Palestine, and owes its origin to the systematic photo survey made over Central Palestine during the war. The lacustrine deposits of the Jordan Valley and their weathering were shown, and also the form of the drainage channels running down into the main valley. The depression of the Dead Sea with reference to the surrounding country has resulted in cañon formation in many places. Some evidences of faulting at different periods can be distinguished. The Jordan at present forms an interesting study in river development, and many of its main features were demonstrated. The relation of the Jordan to the Orontes

has been considered, and an aeroplane photographic survey of the country between the two rivers indicates that the Jordan probably originated in northern Syria in earlier times. The Syrian portion of the stream has been captured by the younger Orontes, and this has had a very important effect on the whole topography of the Jordan Valley.

Linnean Society, November 6.—Dr. A. Smith Woodward, president, in the chair.—Col. H. E. **Rawson**: Plant-sports produced at will. The author had observed near Cape Town that shrubs of Kei-apple (*Aberia caffra*) died when they were deprived of the full sun up to a certain altitude in the early morning. This led to experiments in screening plants about this hour for various periods. "Selective screening" resulted in various sports in form and modifications of colour in *Tropæolum majus*. A special form of *Papaver rhoeas* was obtained and fixed, and other experiments were detailed. The author sums up thus:—The intensity of the light regulates and modifies the coloured bands upon all parts of the plant which have been excited by interference. In Nature selective screening prevails universally, and these experiments suggest that it is deserving of study to bring out its latent potentialities.—L. **Hogben**: Nuclear phenomena in the oocytes of Neuroterus, a gall-fly. The atypical separation of polar bodies in the Hymenoptera parasitica is a consequence of the interruption of the first polar metaphase which appears precociously before the egg is laid. There is no evidence for "amitosis" in the germ-cells of Hymenoptera.—L. V. **Lester-Garland**: A revision of the genus Baphia, Afzel. The author had studied the rich material in the herbaria of the British Museum and at Kew, the number of known species having increased from six (Bentham and Hooker fil. in 1865) to sixty in the present enumeration. The genus is practically confined to tropical Africa, one outlier reaching as far south as Natal, and another as far east as Borneo.

Royal Meteorological Society, November 7.—Sir Napier Shaw, president, in the chair.—Prof. Vilhelm **Bjerknes**: The structure of the atmosphere when rain is falling. Though a comprehensive mathematical analysis of atmospheric movements might be slow in yielding a general solution of the problem of weather forecasting, yet results of practical value were likely to be obtained during the course of the analysis. Such results had been applied to the forecasting of rain in Norway with a fair measure of success. The basis of the method consisted in drawing "lines of flow" of the air and noting where these showed regions of convergence or divergence. Such lines of flow indicated two lines of convergence in a typical depression: (1) where a warm south-westerly wind blows almost normally against the flank of a relatively cold south-easterly current (the warm air rising over the cold here leads to steady rain over a belt some hundreds of kilometres in breadth); and (2) where the cold south-easterly current, curving round the north side of the centre of depression, cuts under the warm south-westerly wind. This causes a region of squally and showery weather along a second narrower belt. Another important application of the lines of flow lies in the forecasting of thunderstorms. Experience showed that in quiet weather in Norway under the system of diurnal breezes certain points regularly become centres of convergence, and it was at these points that thunderstorms first developed, spreading later to surrounding regions.

Royal Anthropological Institute, November 11.—Sir Everard im Thurn, president, in the chair.—S. H. **Warren**: A stone-axe factory at Graig-lwyd, Penmaenmawr. Stone axes of Neolithic types were extensively manufactured out of the fine-grained (andesitic) margin of the Penmaenmawr intrusion of igneous rock. Blocks of scree, many of them of large size, which fell from the crags were gradually flaked down in successive stages until a satisfactory stone-axe blade, ready for polishing, was obtained. There are examples showing every stage of the process, arrested unfinished through accidental breakage, or because the shape being produced was unsatisfactory. Under the last heading it was excessive thickness of the blade which was the greatest source of trouble. Many of the unfinished "wasters" are broken in half, producing the segmental form to variations of which the unfortunate names of "tea-cosy" and "toe-cap" have been applied. Among the waste of the axe-making industry, which is found in great profusion on the mountain-side, the resemblances to Mousterian flake industries are very striking. Equally instructive parallels are to be observed among the "wasters" with characteristic examples of the earlier Palæolithic industries, notably with the earliest of all, or the pre-Chelles. Axes made of the Graig-lwyd rock are being identified from other localities, and further research along these lines is expected to give interesting results.

MANCHESTER.

Literary and Philosophical Society (Chemical Section), October 24.—Sir Henry A. Miers in the chair.—Sir William J. **Pope**: The photography of coloured objects. Previous to the war all the various methods of colour photography—the first of which was devised by Prof. Joly, of Dublin—the modern processes of photographic colour-printing, and the present-day panchromatic photographic methods for obtaining a correct rendering in monochrome of parti-coloured objects, were based upon the success which has been attained in imparting sensitiveness throughout the visual spectrum to the ordinary blue-sensitive photographic plate. By staining the plate with erythrosine it becomes sensitive to green and orange; plates so treated are termed orthochromatic. A number of dyestuffs belonging to the class of cyanine dyes discovered by Greville Williams in 1856 are capable, however, of sensitising a photographic plate throughout the whole range of the visible spectrum. Experimental investigation of sensitising dyestuffs was instituted in the chemical laboratories of the University of Cambridge by Dr. W. H. Mills and Sir William J. Pope at the end of 1914. Methods for producing the ordinary sensitising dyestuffs on a technical scale were devised, and all the sensitisers used by the Allies have been prepared in the Cambridge laboratories since the German importation ceased. The best panchromatic plate made in pre-war days possessed about one-third the sensitiveness to red as to blue light. At the present time a very rapid panchromatic plate is on the market which is much faster to red than to blue light; the rapidity of the plate to red light has been thus increased about fourfold.

DUBLIN.

Royal Irish Academy, November 11.—Prof. G. H. Carpenter in the chair.—Mrs. Lilian **Porter**: Floral development in *Tricuspidaria lanceolata*. Both pentamerous and hexamerous flowers occur. The calyx is quincuncial or irregularly imbricated; the corolla is usually induplicate-valvate, but shows a tendency to contortion; the stamens arise on an enlargement of the receptacle in groups of three alternating with the petals; one stamen is terminal and two are lateral, as in early stages of Tilia, thus emphasising the relationship between Elæocarpaceæ and Tiliaceæ.

PARIS.

Academy of Sciences, November 3.—M. Léon Guignard in the chair.—H. **Deslandres**: Remarks on the constitution of the atom and the properties of band spectra. The concluding paper of four communications on the same subject. A model atom is proposed, the vibrations of which would fall in with the observed regularities in band spectra.—P. **Termier** and G. **Friedel**: The structure of the coal basin of Gard.—P. **Sabatier** and A. **Mailhe**: The catalytic reduction of the halogen acetic esters. At 300° C. ethyl chloroacetate can be reduced by hydrogen in presence of nickel to ethyl acetate, some aldehyde and ethylene being formed by secondary reactions. Under similar conditions ethyl dichloroacetate can be reduced to the monochloroacetate, and ultimately to ethyl acetate. The reaction can also be applied to ethyl trichloroacetate and ethyl bromoacetate.—G. **Bouligand**: Limited and harmonic functions in an infinite domain, zero on the frontier.—S. **Stoïlow**: A classification of ensembles of zero measure.—E. **Kogbetliantz**: The unicity of ultra-spherical developments.—N. E. **Nörlund**: The calculus of finite differences.—T. **Carleman**: Integral equations.—C. **Frémont**: A new method for testing the fragility of metallic tubes. Two new methods of testing notched tubes by shock are detailed.—M. **Amans**: Thrust and power of rotating blades unequally bent.—G. **Fayet** and A. **Schaumasse**: Return of the periodic comet 1911 VII. (Schaumasse). This comet came under the influence of Jupiter, and its elements were, in consequence, considerably modified, and, although the perturbations have been calculated, the exact position of the comet was a matter of uncertainty. After some months' searching a feeble comet (magnitude 12·5) was discovered on October 29, which is very probably the 1911 VII. comet advanced eighteen days. The positions on October 29 and 30 are given, together with the positions of the comparison stars.—G. **Sagnac**: Comparison of experiment with the mechanical theory of the undulatory æther.—G. **Bruhat**: Separators of radiations: application to spectro-polarimetry.—MM. **Ledoux-Lebard** and **Dauvillier**: The fundamental constants of the spectrometry of the X-rays. Different values for the reticular distance d_p for calcite vary between 3·0279 and 3·04 (in 10^{-8} cm.). The results of Bragg, Webster, Compton, Uhler, and Cooksey and Siegbahn are reviewed and in part recalculated, and give $3{\cdot}0346,10^{-8}$ cm. as the most probable figure.—P. **Loisel**: The radio-activity of the water from the large spring at Bagnoles-de-l'Orne and its variations. The amount of radium present in this water varies between 22 and $109,10^{-12}$ g. per litre, with a mean of 68. The cause of the variation is unknown.—J. A. **Muller**: Remarks on chemical decompositions, simultaneous or successive, provoked by physical agents.—J. **Guyot** and J. J. **Simon**: The action of sulphuric anhydride and of oleum on methyl alcohol. The preparation of dimethyl sulphate. The action of 60 per cent. fuming sulphuric acid upon pure methyl alcohol in the proportions indicated in the paper gives a yield of more than 90 per cent. of methyl sulphate.—E. **Léger**: δ-cinchonine and its isomers: its relations with niquine.—M. **Stuart-Menteath**: Some points on the geology of the Pyrenees.—J. **de Lapparent**: Devonian rocks containing radiolaria in the valley of Bruche (Alsatian Vosges).—P. **Mazé**, M. **Vila**, and M. **Lemoigne**: The action of cyanamide and dicyanodiamide on the development of maize. Cyanamide (0·162 gram per litre), with or without nitrate, kills the seedling. Dicyanodiamide at the same concentration does not kill the plant, and in presence of nitrate is not toxic. Neither acts as a plant-food.—M. **Ringelmann**: Researches on the resistance to wear of parts of agricultural machines.—J. **Pellegrin**: The fresh-water fishes of Morocco.—J. **Legendre**: The food of *Eleotris Legendrei*. This fish is strictly carnivorous, and during the winter eats its own species.—V. **Galippe**: Micro-organisms living in paper: their resistance to the action of heat and of time. Living organisms were obtained from filter-paper which had been sterilised in an autoclave at 120° C. Living organisms were also obtained from paper of various ages, the oldest being a papyrus dating from about 200 B.C.—F. **d'Hérelle**: An epidemic of bird-typhus.

MELBOURNE.

Royal Society of Victoria, October 9.—Mr. J. A. Kershaw, president, in the chair.—F. **Chapman**: Notes on a collection of Tertiary fossils from the Ooldea Soak, South Australia. The author identifies two sets of fossils, the older series being Miocene (Janjukian), and the younger a raised beach deposit of older Pleistocene age. The most remarkable of the Miocene fossils is *Orbicella* (*Heliastraea*) *tasmaniensis*, which hitherto has been confined to the Miocene of Tasmania. This appears to indicate the former existence of land across the Great Bight connecting a lost remnant of the former southerly extension of the Australian continent. The later, Pleistocene, deposits at Ooldea contain the foraminifer Orbitolites, now extinct in these latitudes. The Miocene determinations in this area confirm Prof. J. W. Gregory's and Mr. J. T. Jutson's views of the age of similar limestones in Western Australia.—A. J. **Ewart** and J. R. **Tovey**: Contributions to the flora of Australia, No. 28. Two new species are described, *Casuarina Helmsi* and *Plagianthus monoica*, and the appearance of a number of new naturalised aliens, of which one, *Lolium subulatum*, has proved a useful grass in dry districts. An observation is recorded on a Moreton Bay fig, a large tree of which was ringed at the outbreak of the great war, but did not die until the declaration of peace. The death of the tree was due to the starvation of the roots, and as the young wood was removed the older wood retained the power of conducting water indefinitely. Data are also given in regard to the growth-expansion of an elm which appear to throw doubt upon Trowbridge and Weil's conclusion that frost cracks are formed, not by the expansion of frozen water, but by the contraction of the wood of the tree.

SYDNEY.

Royal Society of New South Wales, October 1.—Prof. C. E. Fawsitt, president, in the chair.—G. J. **Burrows**: The hydrolysis of urea hydrochloride.—Prof. O. U. **Vonwiller**: Notes on the elastic properties of selenium. Selenium in the vitreous form shows viscosity effects like those of pitch. When distorting forces are applied, in addition to the immediate elastic strain, disappearing with removal of the forces, there is a continuous yielding, the distortion increasing so long as the forces are applied. The rate of movement is much greater when the substance is illuminated than when it is in darkness. This effect of light has not hitherto been recorded. Selenium in the crystalline form shows the viscosity effect, but it is very much less than with the vitreous modification.

BOOKS RECEIVED.

Elementary Calculus. By C. H. P. Mayo. Pp. xx+345+(Answers) xxxix. (London: Rivingtons.) 10*s.*

School Mechanics. Part. i. School Statics. By W. G. Borchardt. Pp. viii+266. (London: Rivingtons.) 6*s.*

Manganese Ores. By A. H. Curtis. Pp. x+118. (London: J. Murray.) 3*s.* 6*d.* net.

Tin Ores. By G. M. Davies. Pp. x+111. (London: J. Murray.) 3s. 6d. net.

Alcohol: Its Production, Properties, Chemistry, and Industrial Applications. With Chapters on Methyl Alcohol, Fusel Oil, and Spirituous Beverages. By C. Simmonds. Pp. xx+574. (London: Macmillan and Co., Ltd.) 21s. net.

Snapshots of the Wild. By F. St. Mars. Pp. vii+244. (London and Edinburgh: W. and R. Chambers, Ltd.) 5s. net.

Manual of Meteorology By Sir Napier Shaw. Part iv.: The Relation of the Wind to the Distribution of Barometric Pressure. Pp. xvi+166+iii plates. (Cambridge: At the University Press.) 12s. 6d. net.

Examples in Heat and Heat Engines. By T. Peel. Pp. iii+104. (Cambridge: At the University Press.) 5s. net.

Justice and the Poor. By R. H. Smith. Pp. xiv+271. (New York City: The Carnegie Foundation for the Advancement of Teaching.)

A Naturalist's Sketch Book. By A. Thorburn. Pp. viii+72+60 plates. (London: Longmans and Co.) 6l. 6s. net.

Zinc and its Alloys. By Dr. T. E. Lones. Pp. ix+127. (London: Sir I. Pitman and Sons, Ltd.) 2s. 6d. net.

The Transmutation of Bacteria. By Dr. S. Gurney-Dixon. Pp. xviii+179. (Cambridge: At the University Press.) 10s. net.

Opere di Evangelista Torricelli. Edited by G. Loria and G. Vassura. Vol. i., Parte i. Pp xxxviii+407. Vol. i., Parte ii. Pp. 482. Vol. ii. Pp. 320. Vol. iii. Pp. 521. (Faenza: G. Montanari.) 60 franchi the 3 vols.

Animal Life under Water. By Dr. F. Ward. Pp. x+178. (London: Cassell and Co., Ltd.) 7s. 6d. net.

Enjoying Life: and Other Literary Remains of W. N. P. Barbellion. Pp. xvi+246. (London: Chatto and Windus.) 6s. net.

Twenty-four Nature Pictures. By E. I. Detmold. (London: J. M. Dent and Sons, Ltd.) 5l. 5s. net.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 27.

ROYAL COLLEGE OF SURGEONS, at 3.—Annual Meeting of Fellows and Members.

INSTITUTION OF ELECTRICAL ENGINEERS (at Institution of Civil Engineers), at 6.—C. C. Paterson, J. W. T. Walsh, A. K. Taylor, and W. Barnett: Carbon Arcs for Searchlights.

FRIDAY, NOVEMBER 28.

ROYAL SOCIETY OF MEDICINE (Study of Disease in Children Section), at 4.30.—Dr. E. Pritchard: (1) Hypertrophy of Pylorus with other Associated Hypertrophies; (2) Hypertrophy of Lower End of Œsophagus with Papilloma of Cardia.

PHYSICAL SOCIETY, at 5.—Discussion on Lubrication. To be opened by Dr. T. E. Stanton. Speakers include Principal Skinner, W. B. Hardy, F. W. Lanchester, and H. M. Martin. Visitors are invited to this Meeting.

ROYAL SOCIETY OF MEDICINE (Epidemiology and State Medicine Section), at 8.30.—Col. W. Hunter: The Epidemiology of Typhus Fever in Serbia.

MONDAY, DECEMBER 1.

ROYAL SOCIETY, at 4.—Anniversary Meeting.

ROYAL INSTITUTION, at 5.—General Meeting of Members.

SOCIETY OF ENGINEERS (at Geological Society), at 5.30.—Capt. R. Twelvetrees: Mechanical Transport in the War.

ARISTOTELIAN SOCIETY (at 22 Albemarle Street, W.1), at 8.—G. Cator: The Nature of Inference.

ROYAL INSTITUTE OF BRITISH ARCHITECTS (Members' Meeting), at 8.—Architects' Fees for Housing Schemes.

ROYAL SOCIETY OF ARTS, at 8.—Dr. J. T. Hewitt: Synthetic Drugs (Cantor Lecture).

SOCIETY OF CHEMICAL INDUSTRY (at Chemical Society), at 8.—A. Henning: Ethyl Chloride.—C. E. Barrs: The Influence of Impurities in Lead when it is Heated with Concentrated Sulphuric Acid.

ROYAL GEOGRAPHICAL SOCIETY (at Æolian Hall), at 8.30.—H. Wilson Fox: Development of Transport on the Great Lakes of Africa.

TUESDAY, DECEMBER 2.

ROYAL HORTICULTURAL SOCIETY (at Vincent Square), at 3.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.

RÖNTGEN SOCIETY (at Medical Society of London), at 8.15.—Dr. F. Taylor Jones: The Action of Induction Coils.—Major Cooper: Description and Demonstration of New High-speed Interrupter for Induction Apparatus and Frimandeau Coils.

WEDNESDAY, DECEMBER 3.

ROYAL UNITED SERVICE INSTITUTION, at 3.—Air Commodore H. R. Brooke-Popham: The Air Force.

ROYAL SOCIETY OF ARTS, at 4.30.—J. W. Pearson: The Oil Seed Crushing Industry.

ROYAL COLLEGE OF SURGEONS, at 5.—Sir John Tweedy: The Surgical Tradition (Thomas Vicary Lecture).

GEOLOGICAL SOCIETY, at 5.30.

INSTITUTION OF AUTOMOBILE ENGINEERS (at Institution of Mechanical Engineers), at 8.—E. N. Duffield: Car Design and Car Usage from the Point of View of the Majority of Owner Drivers.

SOCIETY OF PUBLIC ANALYSTS AND OTHER ANALYTICAL CHEMISTS (at Chemical Society), at 8.—G. van B. Gilmour: New Distillation Method for Detecting Adulteration in Butter and for Estimating Fats of the Coconut Group.—F. S. Sinnatt and L. Slater: An Investigation into the Composition of the Unsaturated Hydrocarbons Present in Coal Gas.—B. S. Evans: A New Process for the Determination of Arsenic; with Notes on the Chemistry of the Marsh-Berzelius Process.

THURSDAY, DECEMBER 4.

ROYAL SOCIETY, at 4.30.—*Probable Papers.*—A. M. Williams: (1) The Adsorption of Gases at Low and Moderate Concentrations: Part I. Deduction of the Theoretical Adsorption Isotere and Isotherm; Part II. Experimental Verification of the Form of the Theoretical Isoteres and Isotherms. (2) The Adsorption of Gases at Low and Moderate Concentrations: Part III. Experimental Verification of the Constant in the Theoretical Adsorption Isotere.—T. R. Merton: (1) The Secondary Spectrum of Hydrogen; (2) The Spectra of Isotopes.—E. F. Armstrong and T. P. Hilditch: A Study of Catalytic Actions at Solid Surfaces, Part II.—F. Horton and Ann C. Davies: An Experimental Determination of the Critical Electron Velocities for the Production of Radiation and Ionisation on Collision with Argon Atoms.

CHEMICAL SOCIETY, at 8.

FRIDAY, DECEMBER 5.

INSTITUTION OF ELECTRICAL ENGINEERS (Students' Meeting) (at the City and Guilds Technical College, Leonard Street), at 7.—H. M. Barlow: Thermionic Magnifiers.

TECHNICAL INSPECTION ASSOCIATION (at Royal Society of Arts), at 7.30.—R. D. Summerfield and H. J. Davey: Inspection and Testing of Materials.

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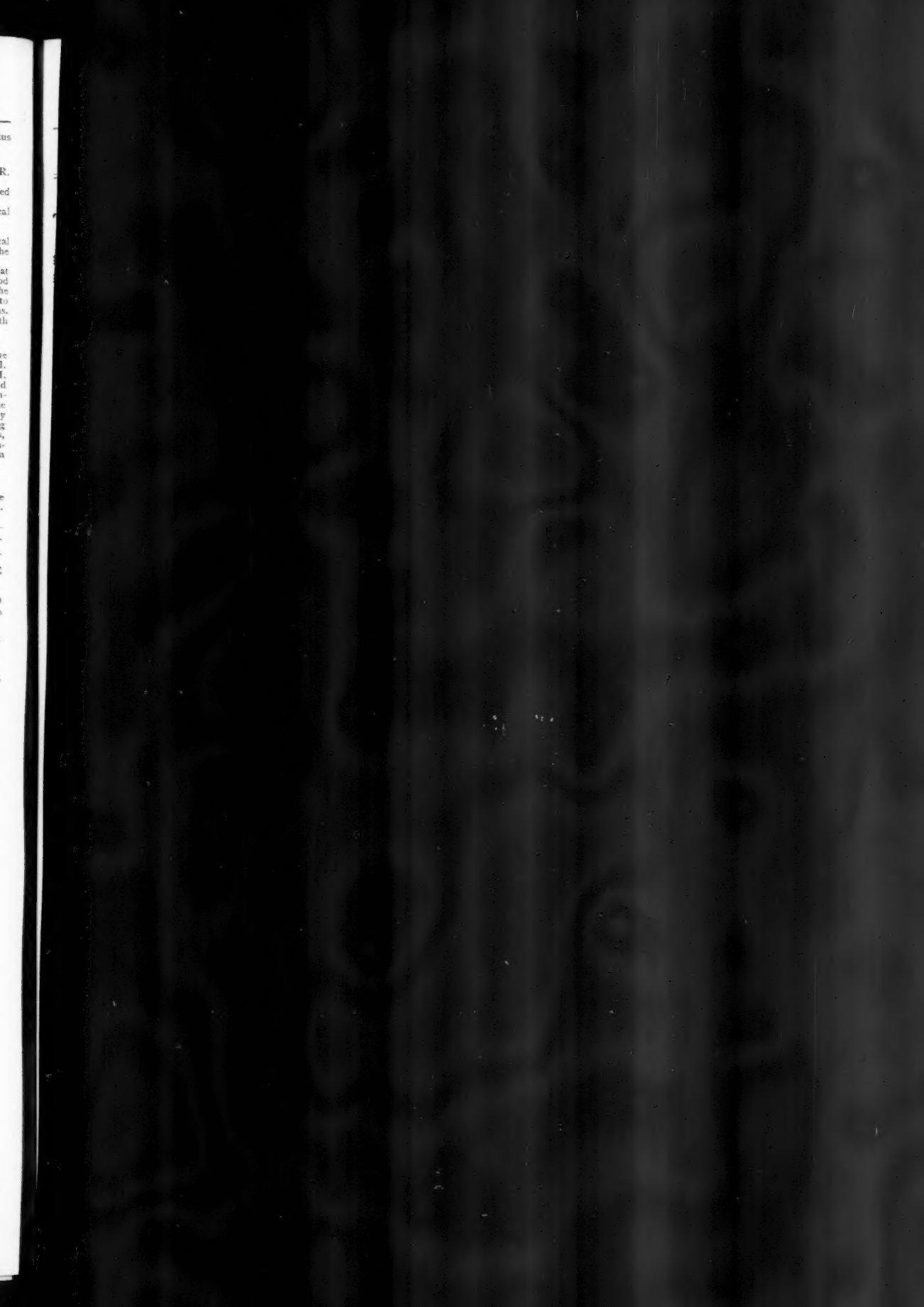
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